# THE PAPER INDUSTRY and PAPER WORLD

AN EDUCATIONAL NEWS MAGAZINE—MAY, 1948



## CONTRACT UNIQUE

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*Wait till you hear more about "Contract Unique." It's the biggest and the most unusual in the annals of the paper manufacturing industry.... Biggest in size and in the amount of machinery involved and in responsibility... 182 Freight Carloads carrying 3948 Tons of Equipment, delivered on schedule, despite many strikes....2950 Tons of Cast Iron, 105 Tons of Brass, Bronze and Copper, 73 Tons of Stainless Steel, 37 Tons of Rubber, etc., etc., used. All this and more is "Contract Unique."*

**DOWNINGTOWN MANUFACTURING CO., DOWNINGTOWN, PA.**

**DESIGNERS AND BUILDERS · PAPER MAKING MACHINERY**

# Somebody's going to hear about this!

The customer's holding the bag right now—but not for long. Some paper maker is going to lose business because the bag wasn't *wet-strengthened* with UFORMITES.

In all kinds of paper products where wet strength counts—count on UFORMITES. As little as 1% resin solids on dry fibre weight boosts wet tensile strength as much as 300%—increases wet rub and scuff resistance—improves dry tensile, Mullen, fold, uniformity of sizing and coating surface characteristics.

There's no pretreatment, special processing or new equipment needed. For Kraft stocks, merely add UFORMITE 467 to the beater—just as you would a rosin size. For sulfite, rag, groundwood—where low acidity is essential—add UFORMITE 470 anywhere at the wet end of the machine. Both UFORMITES are infinitely dilutible with water,—well suited to use at low concentrations usually employed in paper stock systems.

Whether you manufacture bags, wrapping paper, toweling, soft tissues, glassine, map, chart or ledger paper, UFORMITES can increase the value of your product. Write today for full details and samples of these urea formaldehyde resins.

**Handy Facts on Wet Strength**

Your copy of this free booklet will answer your technical questions about how the UFORMITES are used to increase wet strength. Write today.

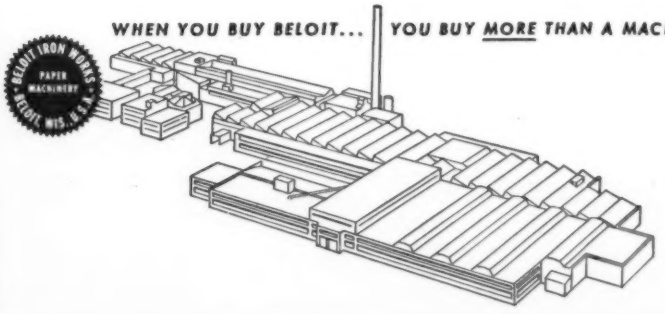
UFORMITE *is a trade-mark, Reg. U.S. Pat. Off.*

## THE RESINOUS PRODUCTS & CHEMICAL COMPANY

*WASHINGTON SQUARE, PHILADELPHIA 5, PA.*

## Need floor-level drives?

In mills requiring floor-level drives, Beloit short center hypoid units have been giving satisfactory service over a number of years. Adjustable V-belts and sheaves are used with a line shaft on the machine room floor. Mill operators find that this equipment eliminates many troubles and is virtually maintenance-free. A number of installations currently are being made.—*Beloit Iron Works, Beloit, Wis.*




*WHEN YOU BUY BELOIT... YOU BUY MORE THAN A MACHINE!*

**BELOIT**

**PAPER MACHINERY**

# SYMBOL OF EXCELLENCE

Throughout the world the Anheuser-Busch trademark is recognized and accepted as a symbol of excellence. Any product which bears the famous "A" and Eagle may be purchased with complete confidence in its quality and performance under the most exacting conditions. Our sales and technical staff is available to discuss any problem with you involving the use of Starches or Dextrines in regular or special formulas to meet your requirements.

- STARCHES
- DEXTRINES
- GUMS
- CORN SYRUP

CORN PRODUCTS DIVISION

## ANHEUSER-BUSCH, INC.

ST. LOUIS, MO.

# Punishment like this Proves the Durability of *Texrope Super-7* V-belts!

**Load! Shock! Grit!** All these demons that destroy V-belts are present in this powerful rock crusher drive. But *Texrope Super-7* V-belts are giving long, satisfactory service, even under conditions like this. For big drive or fractional hp—for every type of service—get these famous V-belts from your nearby A-C dealer or office.

### "PRE-ENGINEERED" TEXROPE DRIVES

You can solve 90% of all V-belt drive problems, from 1 to 150 hp with economical stock *Texrope* V-belts and sheaves. New 144-page manual makes drive selection as easy as finding a number in a phone book. Ask for Bulletin 20B6956. ALLIS-CHALMERS, MILWAUKEE 1, WISCONSIN.

*Texrope, Super-7, Texsteel, Texdrive, Magic-Grip and Vari-Pitch* are Allis-Chalmers trademarks

| A Complete Range of Products | | |
|---|---|---|
| Super-7 V-belts | 5 types . . . sizes to suit every power transmission job | |
| Texsteel, Texdrive, Magic-Grip | Sheaves in a full range of sizes and grooves | |
| Vari-Pitch Sheaves | Exact variations in speed — Stationary or Motion control | |
| Speed Changers | Speed variations up to 375% at the turn of a crank | |

Texrope Super-7 V-belts result from the cooperative research of Allis-Chalmers and B. F. Goodrich; and are sold only by A-C dealers and offices.

A 2429

# ALLIS-CHALMERS

*Originators of the Multiple V-belt Drive for Industry*

Announcing
A NEW NAME FOR
AN OLD COMPANY
The Mathieson Alkali Works (Inc.)
is now
Mathieson Chemical Corporation
Established in 1892 for the manufacture of alkalies, the original company has since broadened its scope of activities to include other chemicals and related specialties. The new name more adequately describes the wider field of operations in which Mathieson is now engaged. Mathieson Chemical Corporation, 60 East 42nd Street, New York 17, N. Y.
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# THE PAPER INDUSTRY and PAPER WORLD

(Reg. U. S. Pat. Off.)

VOLUME 30 - - - - MAY 1948 - - - - - NUMBER 2


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**Published monthly by FRITZ PUBLICATIONS, INC., 59 East Van Buren Street, Chicago 5, Illinois**

EDWARD B. FRITZ, Founder
A. C. FRITZ, Vice Pres. and Treas.
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THE PAPER INDUSTRY and PAPER WORLD is indexed regularly in "The Industrial Arts Index." An index to each volume is issued annually by the publisher as Section Two of the April number.



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**Member:**
**Audit Bureau of Circulation**
**Associated Business Papers, Inc.**

Entered as second class matter June 29, 1938, at the post office at Chicago, Ill., under the Act of March 3, 1879; additional entry at Mount Morris, Ill., March 19, 1948. Subscriptions in the United States, U. S. Possessions, Canada, Cuba and Mexico, $2.00 for one year, $3.00 for two years. All other countries $3.00 for one year, $5.00 for two years.

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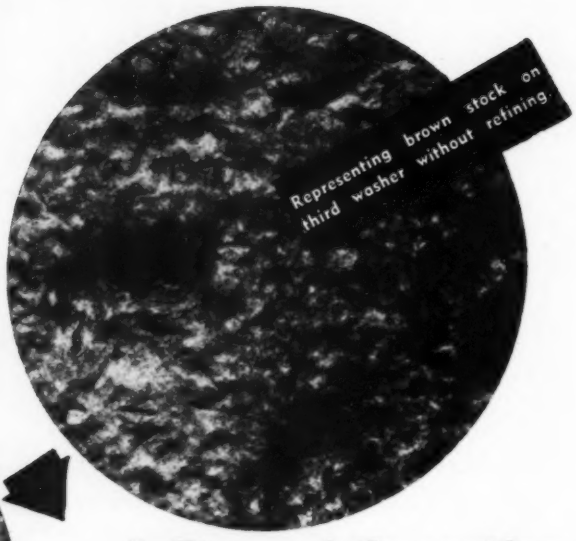

## A Rugged Operation

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Placed between the blow tanks and the washers, they save wood and chemicals . . . permit improved evaporation.

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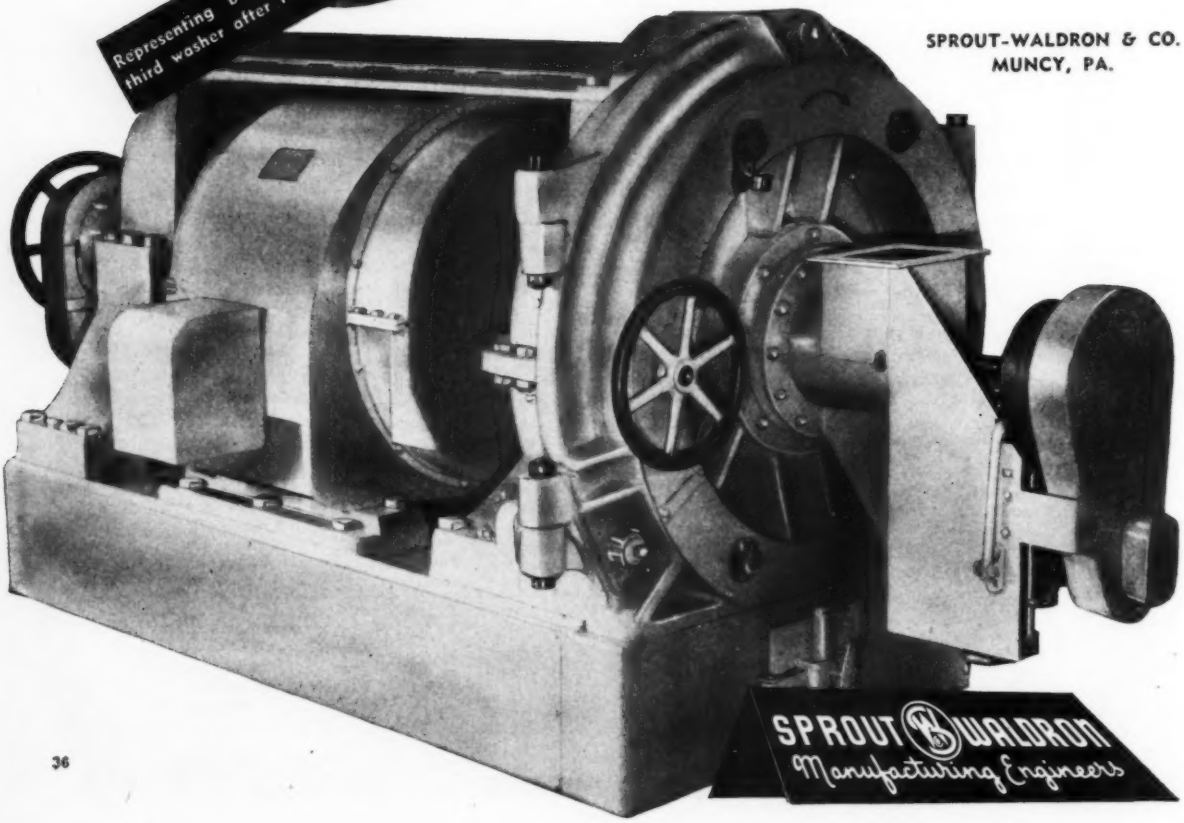


36

# *Efficient, High Capacity Handling with* LINK-BELT BELT CONVEYORS

A wide variety of materials—chips, logs, sulphur, lime, salt cake, wet pulp, hog fuel, etc.—can be handled economically by Link-Belt belt conveyors. High production with low operating and upkeep costs are typical of Link-Belt installations, reflecting the most advanced design and construction of idlers, drive machinery, feeders, discharge chutes, trippers and welded steel pulleys.

Through Link-Belt's vast experience in solving handling problems, these elements are coordinated for smooth, efficient operation, in correct relation to the type of belt and the nature of the materials to be handled.

The above view, in a West coast paper mill, shows a transfer point between two Link-Belt belt conveyors at right angles, carrying wood chips at the rate of 45,000 cu. ft. per hour.

15,375-A

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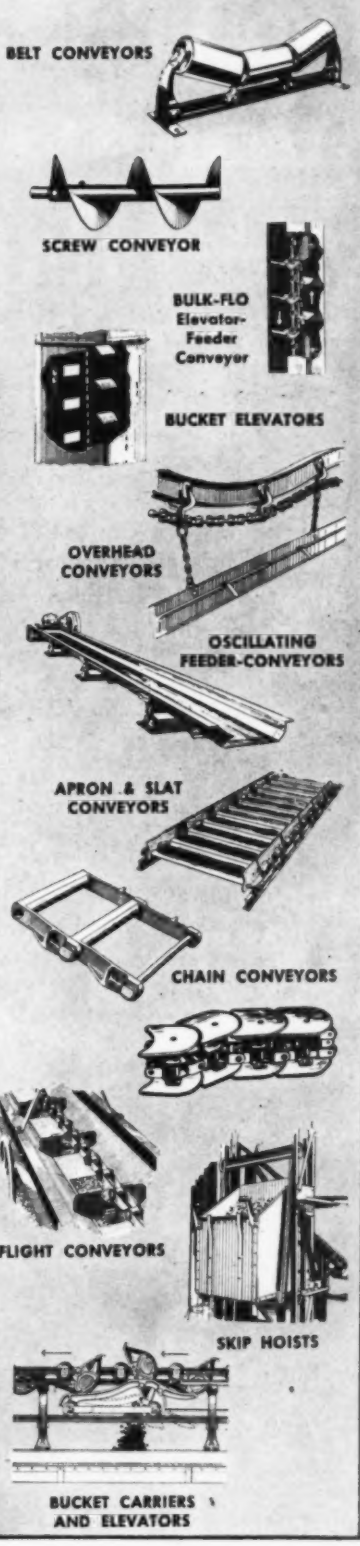
### OTHER TYPES OF LINK-BELT CONVEYING MACHINERY



# YOU USE 4 + 8

# YOU GET 100,000

That's all it takes! Four basic circuits and 8 basic component parts give you more than 100,000 different electronic instrument combinations for processing use.

Flow, level, speed, pressure, temperature, gas analysis, pH, conductivity, etc.—all can be controlled with these interchangeable Bailey units.

With Bailey controls, replacement part stocks are held to a minimum because parts are interchangeable. Maintenance costs are less, too, because maintenance men quickly become familiar with the standardized Bailey units.

Bailey bulletin No. 17 shows how you can use this improved control system. Write for your copy and keep it handy for reference the next time you need process controls.

P-19-A

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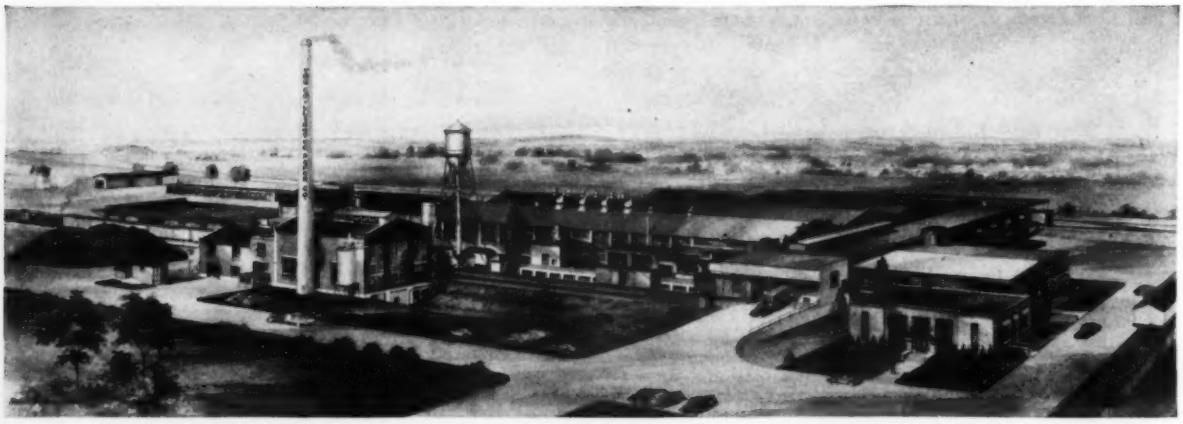
*Controls for the Paper Industry*
TEMPERATURE • FLOW • PRESSURE
GAS ANALYSIS • LEVEL • RATIO



**4 + 8 Works Here** at the Chillicothe Paper Co., Chillicothe, Ohio

# Simonds Cuts RIGHT "ON THE LINE" ...EVERY TIME

Yes, "when you use Simonds . . . you *stay* in the Highlands of *consistent* cutting efficiency." No face-drag or feather-edge in cutting. No peaks and valleys in output. Every cut with a Simonds Paper Knife is clean and sharp . . . and you get far more cuts between grindings.

Simonds special S-301 Steel has unmatched toughness and edge-holding qualities. And Simonds special manufacturing methods guarantee correct hardness and temper, uniform taper, and just the right job of concave-grinding for proper face clearance. Let Simonds keep *your* knife costs right "on the line". Order S-301 Paper Knives *today*.

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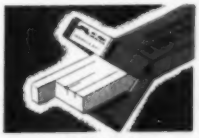

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An 18th century paper factory . . . The paper industry was one of the first to employ women . . . shown here smoothening paper.

# *This was the* ART OF PAPER MAKING

Sheet by sheet the early paper maker produced paper . . . interested in making one perfect sheet at a time. This was an art—the beginning of an industry that today produces tons of paper instead of sheets.

Even in the early days—when paper making was an art—felts were part of the equipment of the paper maker. As the art progressed into an industry, felts progressed with the industry.

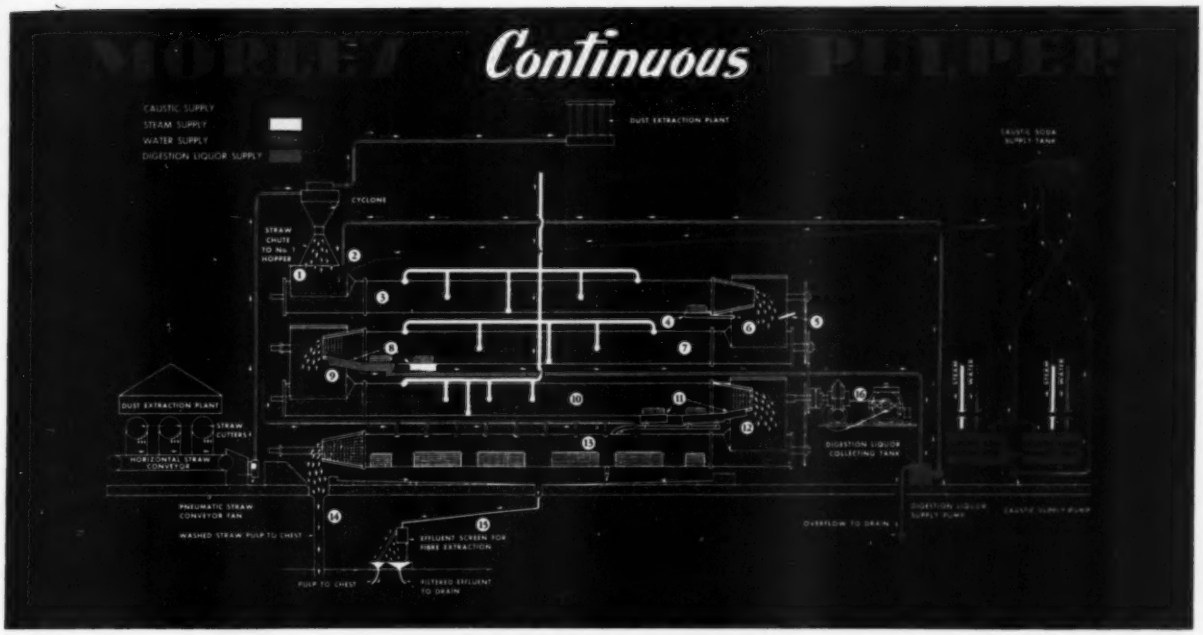
Since 1890 Appleton Felts have kept pace with paper making . . . that's why today they are preferred by mills everywhere.

This is one of a series depicting the early history of paper making.

**APPLETON WOOLEN MILLS**

APPLETON
WISCONSIN

# Continuous MORLEY PULPER

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## for continuous pulping of Cereal Straws, Bagasse, and the like

**The MORLEY CONTINUOUS PROCESS AND APPARATUS, now in mill operation for five years, is a proven efficient method, operating at atmospheric pressure only. It economically and continuously processes cereal straws and other cellulosic materials to pulp for the ultimate manufacture of quality Paper and/or board, for example: .009 Corrugated, Tube Stock, Wall Board, and many grades requiring rigid characteristics.**

- Continuous Feed and Digestion at high density.
- Operates at atmospheric pressure and low temperature.
- For .009 corrugating and board grades, average yields 69-70% based on straw, as used, averaging 12% moisture.
- Low steam consumption.
- Low overall power consumption.
- Digestion period is approximately 20 minutes for .009 corrugating or board grades. This insures minimum degradation of finer fibres, and reduces shrinkage.
- Space required for one 50-ton Unit is 7,000 cubic feet, a saving of approximately 65% over conventional equipment.

*Write for Morley Brochure*

*KEY TO FLOW DIAGRAM:*

1 No. 1 Tube Hopper
2 Caustic Soda Orifice metering system
3 No. 1 Tube Impregnator
4 Screen Plate and Drainage Line for Digestion Liquor to No. 2 Tube
5 Recording Thermometer
6 No. 2 Tube Hopper
7 No. 2 Tube Digester
8 Screen Plates and Drainage Line for Digestion Liquor to Collecting Tank
9 No. 3 Tube Hopper
10 No. 3 Tube Digester
11 Screen Plates and Drainage Line for Spent Liquor to Drain
12 No. 4 Tube Hopper
13 No. 4 Tube Washer
14 Washed Straw Pulp to Chest
15 Spent Liquor Supply to Effluent Screen
16 Motor, Texrope, and Reduction Gear Drives

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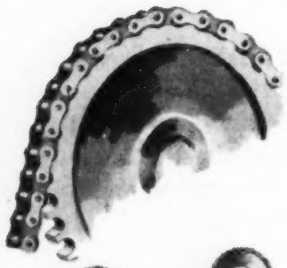
**122 EAST 42nd STREET NEW YORK, N. Y.**

**FOR GREATEST EFFICIENCY IN SMALLEST SPACE**

# . . . rely on Roller Chain!



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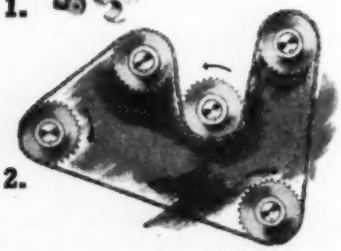

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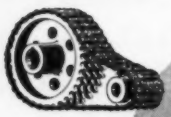


YOU'LL get greatest efficiency . . . sustained efficiency . . . in the smallest overall space with a roller chain drive. For only roller chain gives you all these advantages:

**1.** *Positive transmission of power.* Since roller chain depends on positive contact with sprocket teeth . . . does not rely on tension . . . it does not slip and waste power. Speeds can be fast or slow . . . roller chain is equally efficient at both throughout its working life. It accurately times machine operations.

**2.** *Transmit more horsepower in less space.* The width of a chain drive is relatively narrow compared to other types of drives, *regardless of load conditions.* It requires only minimum wrap around sprockets . . . can drive multiple shafts from a single power source. On large reduction drives, roller chain will operate over smaller wheels than drives dependent on tension, since they need less arc of contact for effective operation. Center distances can be varied as desired, assuring the most effective use of your space.

**3.** *Easily installed.* Just mount the sprockets on the shafts, wrap the chain around the sprocket and couple the chain. That's all there is to it. There's no need to move or remove the shafts.

*AND, in addition,* roller chain drives last longer because load is distributed over many sprocket teeth. They require fewer adjustments, impose less load on shafts and bearings and absorb damaging shocks.

For all the facts on roller chains and how they can help you, see your Baldwin-Rex Man, or write direct to Baldwin-Duckworth Division of Chain Belt Company, 367 Plainfield Street, Springfield 2, Mass.

# BALDWIN·REX

## ROLLER CHAINS

BALDWIN-DUCKWORTH DIVISION OF CHAIN BELT COMPANY

# MARATHON *Speeds* PULP PRODUCTION WITH 7 YARWAY DIGESTER VALVES

At this "world's most modern pulp mill" seven Yarway 8-inch Motor-Operated Digester Blow Valves are on the job, discharging the contents of huge digesters through the blow lines into the blow tanks.

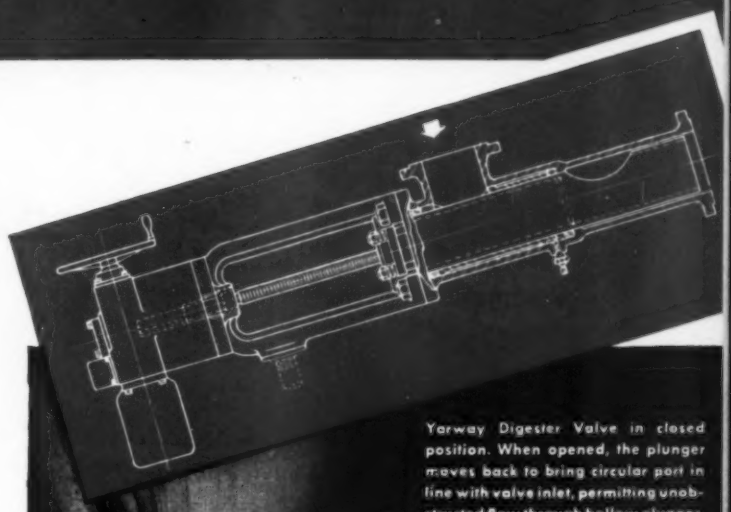
Throughout the paper industry, Yarway Digester Valves are outstandingly successful. The famous Yarway *Seatless* principle, assures a *tight* valve—effectively sealing off the digester, preventing loss of black liquor, increasing number of cooks per day.

Metallurgical advancements permit Yarway Digester Valves to withstand the high pressure, shock and chemical action always encountered in this rigorous service.

In one mill, Yarway Valves increased production 1½ to 2 cooks a day. Another reports maintenance is lower than on any other type. The Motor Control on these valves is so simple, anyone can operate them.

For more information on these production-boosting digester valves, write . . .

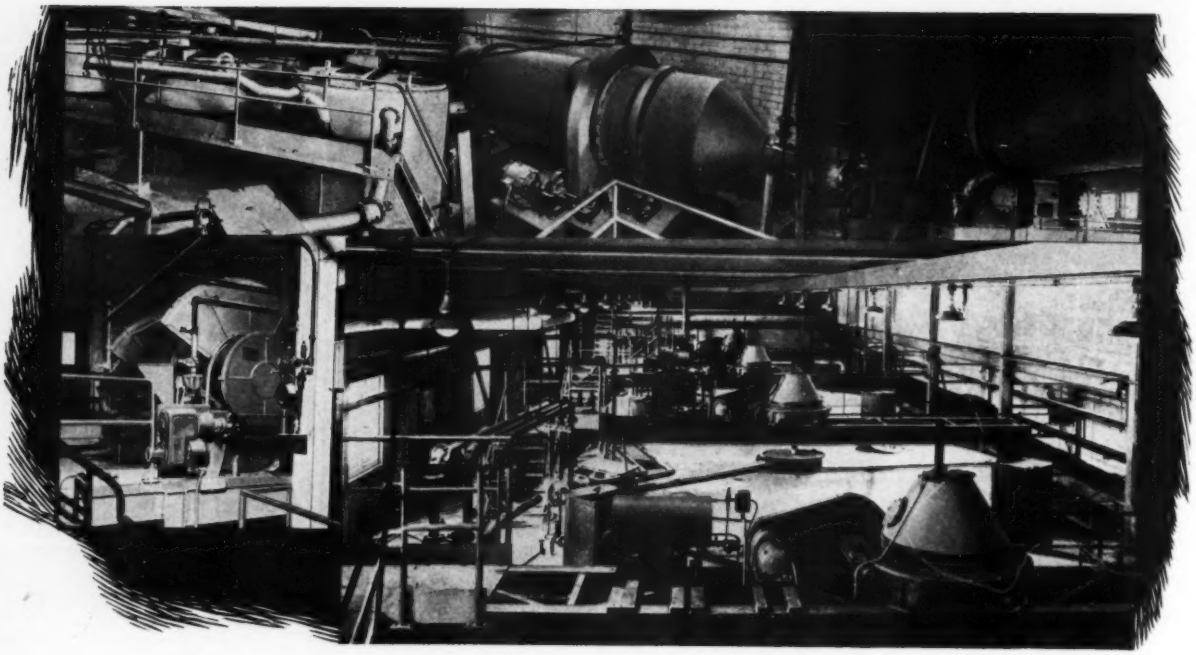
**YARNALL-WARING COMPANY**
**149 Mermaid Ave., Philadelphia 18, Pa.**



Yarway Digester Valve in closed position. When opened, the plunger moves back to bring circular port in line with valve inlet, permitting unobstructed flow through hollow plunger.

Yarway Motor-Operated Digester Valve in Marathon plant—one of seven installed here.

**YARWAY BLOW-OFF VALVES**



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Process know-how and correct design engineering, permit each piece of equipment — slaker, causticizers, thickeners, filter, scrubber, kiln, etc. to work in unison to produce more uniform operation with:

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- Lower lime consumption.
- Cleaner white liquor to digesters.
- Lower soda losses.
- Better lime kiln operation.

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# *YOU, too, may find your answer to valve troubles due to corrosion, contamination or suspended solids, in*

# GRINNELL-SAUNDERS DIAPHRAGM VALVES

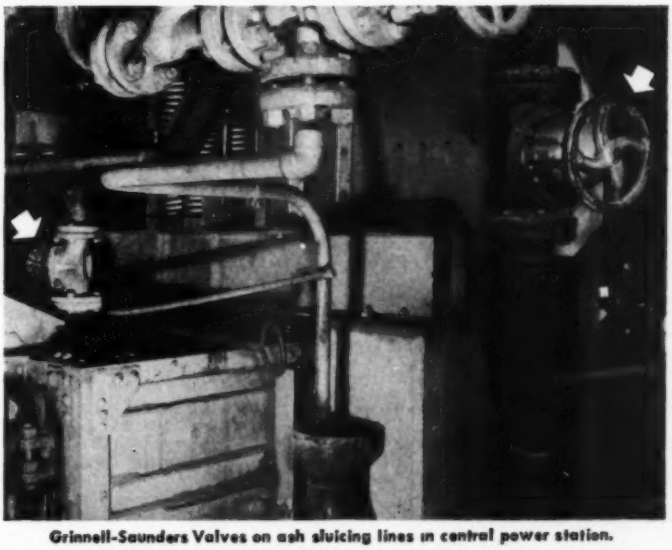
ISOLATED WORKING PARTS — The flexible diaphragm isolates working parts of the valve from the fluid, preventing contamination or corrosion.

CORROSION-PROOF LININGS — A selection of diaphragm materials and also body linings of glass, porcelain, lead, rubber or synthetics to suit your service requirements.

STREAMLINED FLOW . . . POSITIVE CLOSURE — Streamlined passage without pockets minimizes friction. Large area of contact of the diaphragm, plus diaphragm resilience, permit positive closure even when solids are trapped.

Write for catalog—Grinnell-Saunders Diaphragm Valves.

GRINNELL COMPANY, INC.
Providence 1, R. I.



Grinnell-Saunders Valves on ash sluicing lines in central power station.

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GRINNELL
WHENEVER PIPING IS INVOLVED

**TITANOX . . .** *the brightest name in titanium pigments*

# "Show-Through" is through when TITANOX comes in

There isn't room for this "show-through" spook in paper. That's why paper makers use TITANOX pigments. These titanium dioxide pigments impart the utmost attainable degrees of opacity, whiteness and brightness, and minimize "show-through". Paper takes on a more attractive appearance. Customers work without fear of print showing through. And you know how such desirable paper stock is easier to sell!

Due to the effectiveness of these pigments, the TITANOX line continues in greater demand than the output. To meet this demand, production is being increased as rapidly as possible. In the meantime, our Technical Service Laboratory can show you how to get the most out of your available supply. This help is yours by contacting our nearest office.

6401

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# WIRES LAST LONGER
# with table rolls on Timken® bearings

PAPER mill operators have found that Timken bearings on paper machine rolls make wires and felts last longer.

Timken tapered roller bearings save money other ways, too—prevent leakage of lubricant and resultant spoilage of paper, reduce maintenance, eliminate down-time resulting from bearing failures.

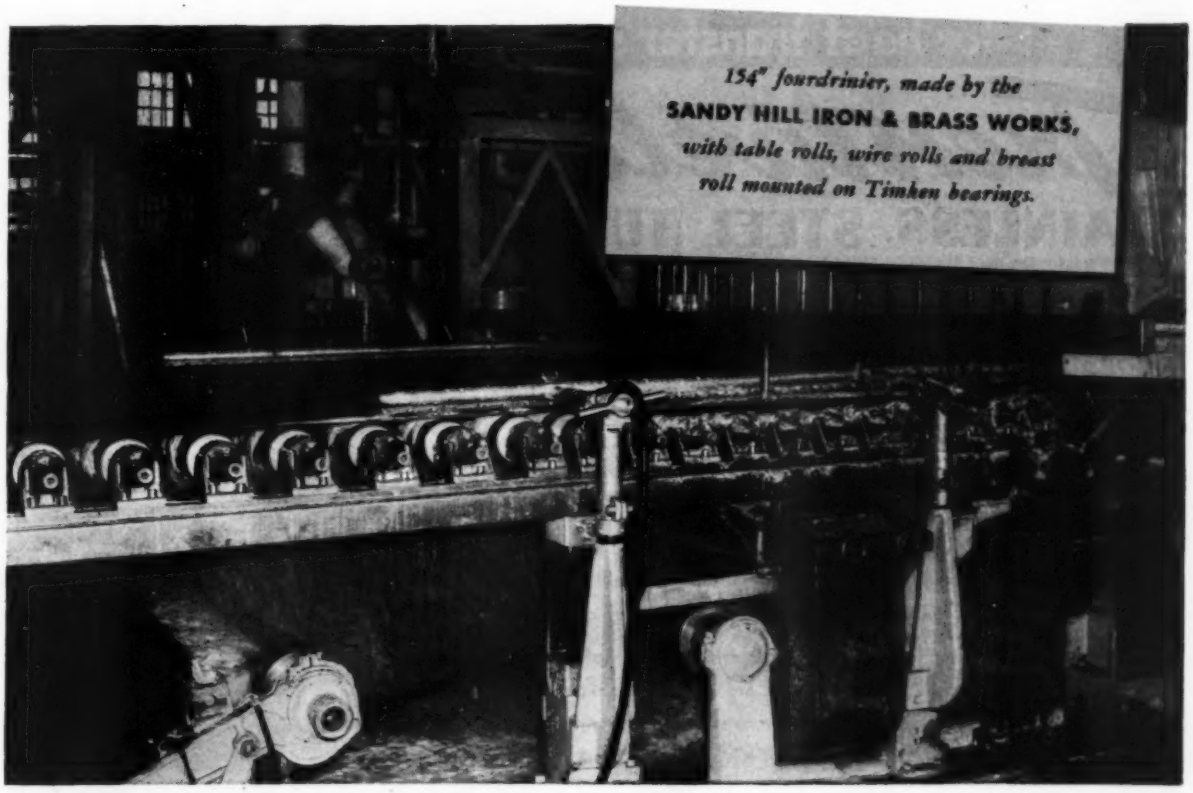
Due to the tapered construction of Timken bearings, they carry any combination of radial and thrust loads. Manufactured to extreme precision and finished to incredible smoothness, Timken roller bearings make friction practically negligible. Maximum load capacity is provided by the line contact between rolls and races.

Timken bearings permit closures which retain lubricant—keep water out. And since they're made of the finest alloy steel ever developed for tapered roller bearings — Timken fine alloy steel—they last the life of the machine.

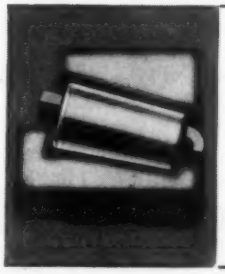
Backed by 49 years of bearing research and development, Timken tapered roller bearings are first choice throughout all industry. No other bearing can bring you *all* the advantages you get with Timken bearings. Look for the trade-mark "Timken" on every bearing you use. The Timken Roller Bearing Co., Canton 6, O.

TIMKEN BEARING EQUIPPED

*This symbol on a product means its bearings are the best.*



*154" fourdrinier, made by the* **SANDY HILL IRON & BRASS WORKS,** *with table rolls, wire rolls and breast roll mounted on Timken bearings.*



**GREATER LOAD AREA**

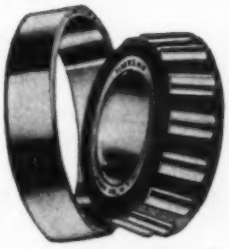
Because the load is carried on the *line* of contact between rollers and races, Timken bearings carry greater loads, hold shafts in line, wear longer.

The Timken Roller Bearing Company is the acknowledged leader in: 1. advanced design; 2. precision manufacturing; 3. rigid quality control; 4. special analysis steels.

**TIMKEN**

TRADE-MARK REG. U. S. PAT. OFF.

**TAPERED ROLLER BEARINGS**



NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▱ BEARING TAKES RADIAL ◫ AND THRUST ⊣◫⊢ LOADS OR ANY COMBINATION ✳

for heat transfer service

# Trentweld

## STAINLESS STEEL TUBES pay for themselves in TIME

**They save TIME *by the hour* in installation**
**They gain TIME *by the year* in length of service**

Today, time runs into money, more money than ever before. If you agree with this, then the advantages of Trentweld stainless steel tubes are for you . . . for here is heat exchanger tubing, made to specifications that cut costs — all costs.

To begin with, Trentweld tubes are thin-walled and have a soft temper. They roll or weld into tube sheets easily. All tolerances are held to micrometer limits to provide pressure tight joints easily. They go in fast, makes a smooth-running, time-saving job of installation. More than that, all Trentweld tube is pressure-tested, is pickled for increased corrosive resistance and is flare-tested for ductility. Back of these precision standards is an exclusive method of rolling and fabricating stainless tubing that gives Trentweld performance stamina not to be found anywhere else.

These are only the highlights on this work-horse tube. All of the facts are yours for the asking. Call on Trentweld engineers, without obligation, for specific information, or write for the Trentweld Data Bulletin.

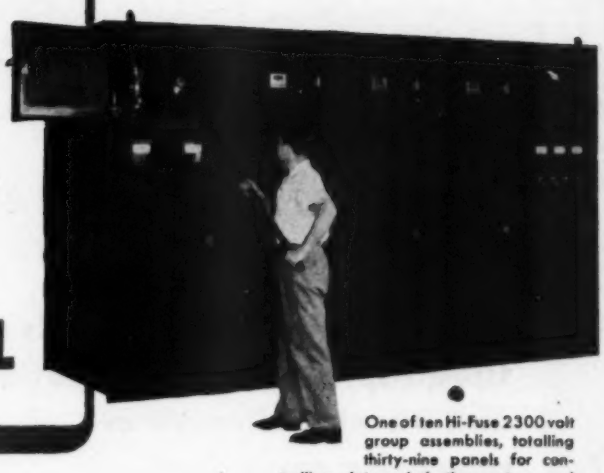
**District Offices—New York, Chicago**

TRENTWELD STAINLESS STEEL TUBES

## TRENT TUBE MFG. CO.

**440 Church Street, East Troy, Wisconsin**

# CHECK-REIN
## *for high-stepping*
## HORSE POWER
### WITH
# E-M
# "HI-FUSE" CONTROL



One of ten Hi-Fuse 2300 volt group assemblies, totalling thirty-nine panels for controlling sixteen induction motors and twenty-three synchronous motors at a southern paper mill.

HIGH-STEPPING horse power in today's industrial plants needs tight-reined control.

You can harness this rampant high-voltage with E-M "Hi-Fuse" Control for motors from 2300 to 4600 volts.

Horse-and-buggy day practice was to provide no short circuit protection. This was followed with a large, expensive, high-interrupting capacity switch. Contrast that with the new E-M "Hi-Fuse" Control system using the elements shown in the diagram at the right. "Hi-Fuse" does a thorough job of protecting and controlling your high voltage motors . . . "Hi-Fuse" costs you less. In every way, it's a better buy!

"Hi-Fuse" gives you these advantages:

**SHORT CIRCUIT PROTECTION**—current limiting type high interrupting capacity power fuses (up to 250,000 kva) cut off the short circuit current in a fraction of a cycle. Quick action saves motor and control from damage.

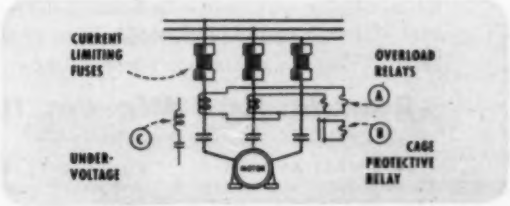
**MOTOR PROTECTION**—the current limiting fuses provide a means of disconnecting the motor from the line, as shown in the photo above. As the oil switch is not required to furnish short circuit protection, a smaller, less expensive switch is adequate. Coordinated with this switch and the fuses are overload and out-of-step relays to protect the motor from sustained overload, locked rotor, single phasing, under voltage, or too frequent starting.

**POLARIZED FIELD FREQUENCY STARTING**—in synchronous motors this "almost human" relay assures the highest synchronizing torque and minimum current in-rushing during starting. The Polarized Field Frequency system of starting was developed by E-M and for many years has been accepted as the best method of controlling the application and removal of field excitation of synchronous motors.

Here, then, is "Hi-Fuse" Control! It's the ideal system to give you the coordinated motor control you need in your plant! "Hi-Fuse" controls are available for both induction and synchronous motors, and are applicable generally without analysis of the short circuit current. For group assembly, both AC and DC buswork is provided. Segregated high and low voltage compartments and electrical interlocks help to provide for the safety of operators.

The "Hi-Fuse" Control unit is completely packaged ready for quick installation. It's attractive in appearance and strongly built. The doors are piano-hinged. Sturdy metal construction throughout.

Sum up what "Hi-Fuse" Control will do for you in your plant. You'll find it's the best buy for SURE protection and control of all your high voltage motors. Be sure to get full information about "Hi-Fuse" Controls NOW! Write for our technical bulletin 192.




● Simplified Connection diagram shows elements of protection provided for the motor in "High-Fuse" Control.

**ELECTRIC MACHINERY MFG. COMPANY**
**MINNEAPOLIS 13, MINNESOTA**

3100-TPA-2073

E-M

**Specialists in**
**BIG MOTOR ENGINEERING**

# How to make sure...

## OF CONSTANTLY CORRECT FLUID TEMPERATURES

### by compensating for effects of tube fouling, load fluctuations and varying climatic or operating conditions

For general, low to medium pressure cooling of oil, water and other fluids, major machinery builders have standardized on Ross "CP" Exchangers as original equipment on Diesels, hydraulic presses and compressors. By this selection, they feel, the industrial user is assured of continual cooling efficiency as required and specified... *so vitally important where excessive heating would interfere with the operation of parts machined to close tolerances.*

Because each "CP" is individually assembled from selected, standard, mass-produced parts, the unit which you purchase, either through your machinery supplier or direct from Ross, is able to provide large factors of safety against the varying conditions which you have specified. "Quite an achievement", you'll say, "for a *standard* cooler that eliminates high cost, special engineering and fabrication."

**For a simple explanation on how Ross achieves these factors of safety with standardized units, write for a free copy of illustrated BULLETIN 5322. Then, you'll insist upon Ross.**

**Ross Heater & Mfg. Co., Inc.**

Division of American Radiator & Standard Sanitary Corporation

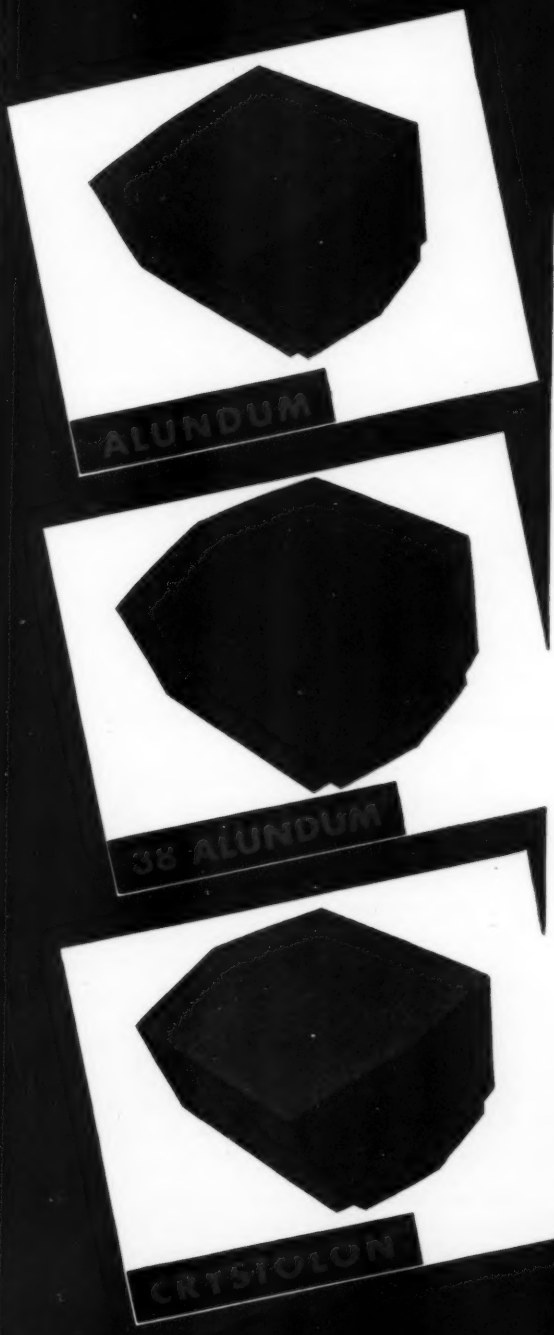
1430 WEST AVENUE BUFFALO 13, N. Y.

**ROSS "CP" EXCHANGERS**

Ross equipment is manufactured and sold in Canada by Horton Steel Works, Ltd., Fort Erie, Ontario

# Norton Has the Right Kind of Abrasive

## To Produce Your Kind of Pulp




YES, every Norton Pulpstone is individually engineered to produce just the type of pulp that you require—and this engineering starts with the selection of the right abrasive. Whether it will be ALUNDUM, 38 ALUNDUM, or CRYSTOLON abrasive depends on the kind of wood you are grinding and the type of equipment you are using.

**ALUNDUM** abrasive is an aluminum oxide product—made by fusing the mineral, bauxite in arc-type electric furnaces at 3700° F. Its hard, tough grains produce a high quality pulp.

**38 ALUNDUM** abrasive is also an aluminum oxide product but with somewhat different chemical and physical properties which make it especially suitable for producing certain types of pulp.

**CRYSTOLON** abrasive is a silicon carbide product made by fusing metallurgical coke and silica sand in resistance-type electric furnaces. Its characteristics of hardness and sharpness have made CRYSTOLON stones well known for many years as high producers of quality pulp.

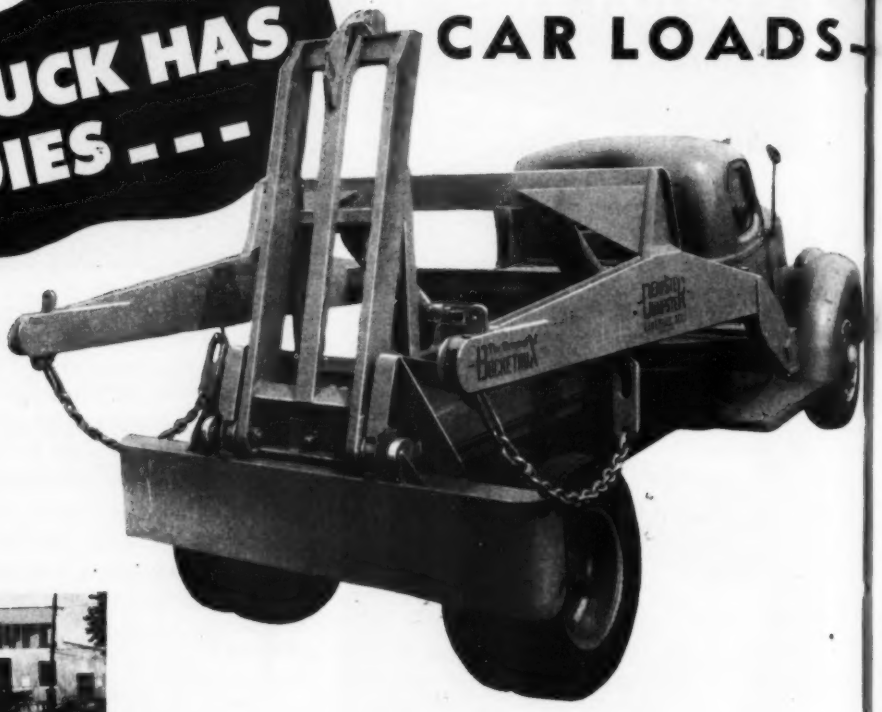
You can be sure that Norton can furnish just the right stone for every grinder in your mill.

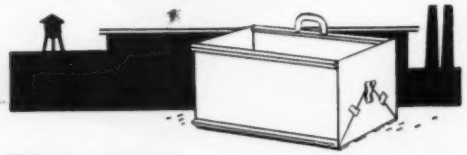
**NORTON COMPANY, WORCESTER 6, MASS.**
NORTON COMPANY OF CANADA, LTD., HAMILTON, ONTARIO

NORTON ABRASIVES

# THIS TRUCK HAS 37 BODIES - - -

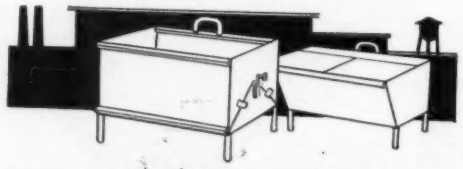
## . . . HANDLES 2
## CAR LOADS-O





**FELT MILL DIVISION**

Produces 30 cu. yds. of scrap and clean-up per day. Two, 6 cu. yds. Heavy Duty Drop Bottom Bodies are used.



**ROOFING MILL AND MACHINE DIVISION**

Produces 104-1/2 cu. yds. of tabs, shingle scrap, slate scrap and roofing scrap per day. Seventeen, 5 cu. yds. Drop Bottom Bodies on legs and two, 2 cu. yds. Water-Tight Tilt Type Bodies on legs are used.

*Shown at right are 4 standard types of Dempster-Dumpster bodies. Many variations are available to make these bodies meet every materials handling requirement. Sizes range from 1-1/2 to 20 cu. yds. capacities. A Dempster-Dumpster engineering survey, without obligation to you, will doubtless show tremendous savings for your plant. Write or wire us now.*

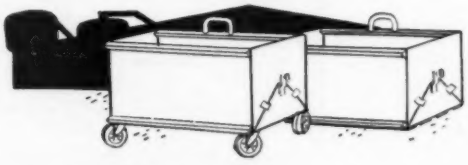
# 220 CUBIC YARDS—4 RAILROAD CARS OF WASTE AND SCRAP DAILY—

**HERE IS A TYPICAL EXAMPLE OF LOW COST DEMPSTER-DUMPSTER MATERIALS HANDLING IN INDUSTRIAL PLANTS. IN THIS CASE, IN A LARGE ROOFING PLANT.**

In one of the nation's largest roofing plants, collection and removal of waste and scrap had developed into an expensive problem. Approximately 220 cu. yds. —about 4 railroad car loads—of every type of waste . . . heavy, light, bulky, moist and dry, had to be collected daily from many points in this widespread plant . . . some in driblets, some in large volume. A more flexible, less expensive system of collection was vital.

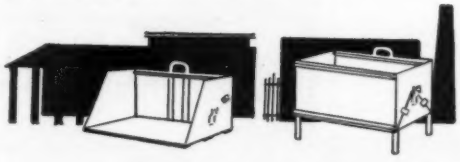
A Dempster Engineering Survey showed how one Dempster-Dumpster Hoisting Unit on truck, serving 37 detachable bodies of various types could collect and dump the plant's entire daily scrap output in only eight hours. As a result of this comprehensive survey, Dempster-Dumpster system was put to work. Spotting the bodies at predetermined accumulation points throughout the plant, the truck hoisting unit and one man, the driver, hydraulically pick up each body as it is filled . . . haul it . . . dump it and return it for reloading (as illustrated at extreme left). The different types of bodies were ordered for most effective materials handled . . . heavy duty bodies for heavy slate scrap . . . light bodies for light bulky felt scrap. Bodies on casters, pushed right up to the machine to receive scrap, eliminated wheelbarrow and hand carrying. At another point bodies are carried in and out of the building by the plant's power driven platform-lift trucks. Scrap collection in this plant is now made on an efficient time-table basis. Savings, over the original cost of handling waste and scrap, have paid for the entire installation in almost 12 months. In many other installations in less time.

Here is how the Dempster-Dumpster System serves all plant sections simultaneously. Replacing an obsolete system of truck-drawn hard wheel trailers, clumsy bins, wheelbarrow handling and hours of useless clean-up time, this installation comprises one truck hoisting unit and 37 bodies in 7 different types. Bodies receive the scrap as it accumulates. When a body is filled, it is picked up by the truck hoisting unit, carried to the disposal area, dumped and returned for refilling. Seven main plant sections are served by the truck hoisting unit, as shown below. Amount of scrap produced and body used is also shown.



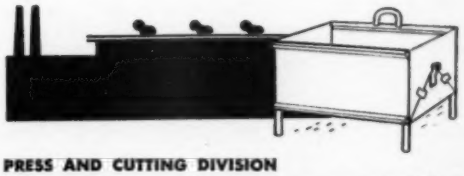
**HYDRO-PULPER DIVISION**

Produces 28 cu. yds. of scrap per day. One, 6 cu. yds. Heavy Duty Drop Bottom Body and four, 6 cu. yds. Drop Bottom Bodies on casters are used.



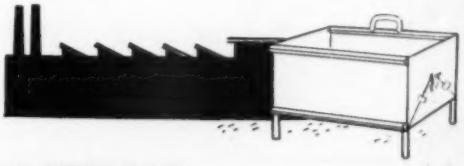
**LOADING DOCK AND POWER HOUSE**

Produce varying amounts of waste, debris and waste coating in drums. For loading Dock, one 2-1/2 cu. yds. Skip Type Body. For Power House, one, 2-1/2 cu. yds. Drop Bottom Body on legs are used.



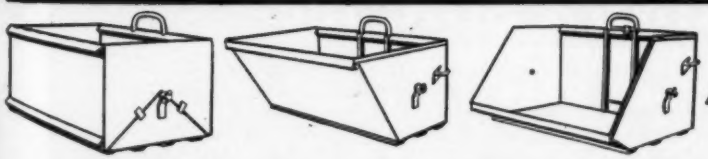
**PRESS AND CUTTING DIVISION**

Produces 24-1/2 cu. yds. of roofing scrap and cuttings per day. Five, 5 cu. yds. Drop Bottom Bodies on legs are used.



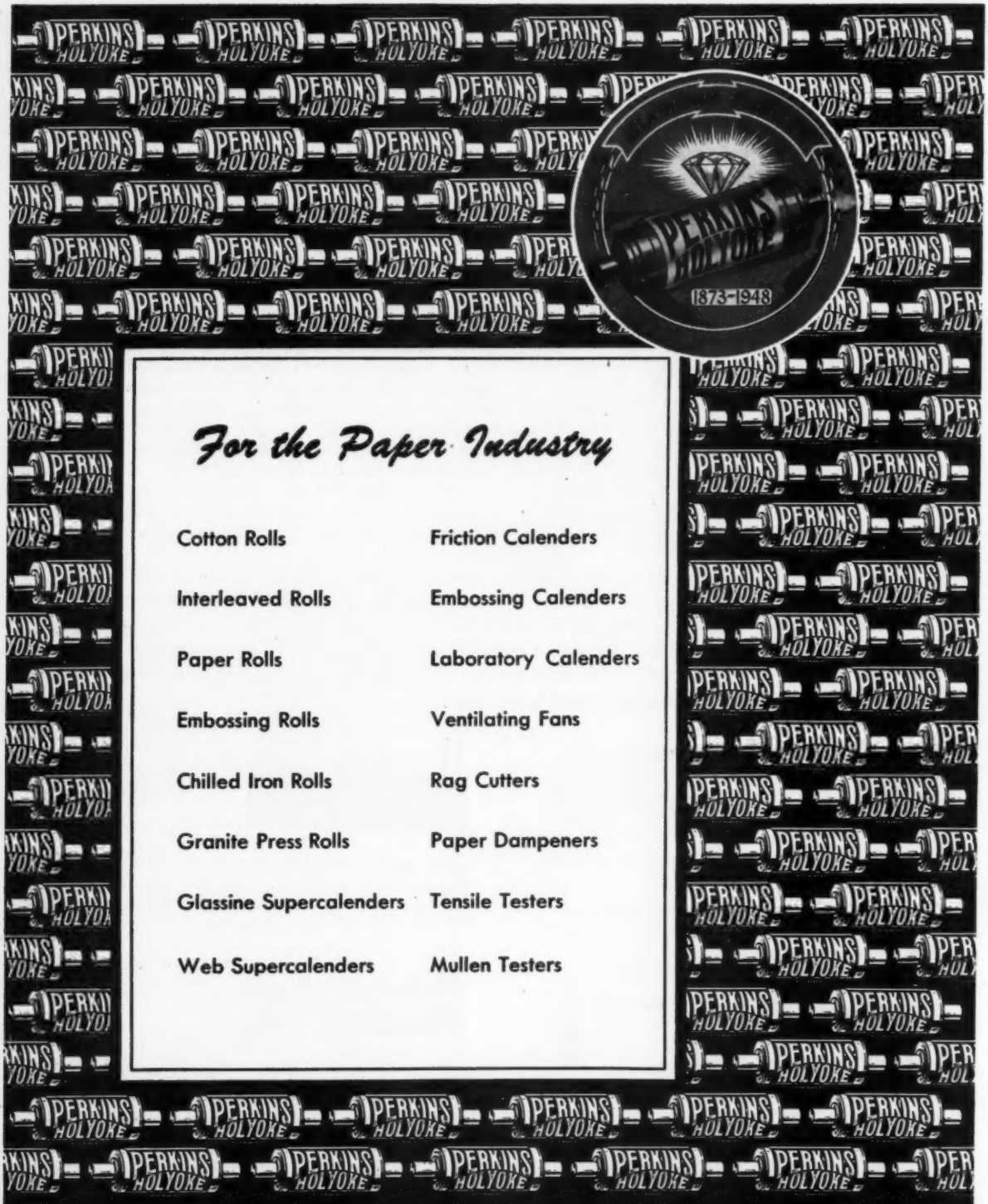
**DIE CUTTING PLANT**

Produces 30 cu. yds. of scrap per day. Four, 4 cu. yds. special duty Drop Bottom Bodies on legs are used.



DEMPSTER DUMPSTER TRADE MARK REG. SYSTEM

**DEMPSTER BROS., INC., 758 Dempster Bldg., Knoxville 17, Tennessee**




## *For the Paper Industry*

| | |
|---|---|
| Cotton Rolls | Friction Calenders |
| Interleaved Rolls | Embossing Calenders |
| Paper Rolls | Laboratory Calenders |
| Embossing Rolls | Ventilating Fans |
| Chilled Iron Rolls | Rag Cutters |
| Granite Press Rolls | Paper Dampeners |
| Glassine Supercalenders | Tensile Testers |
| Web Supercalenders | Mullen Testers |

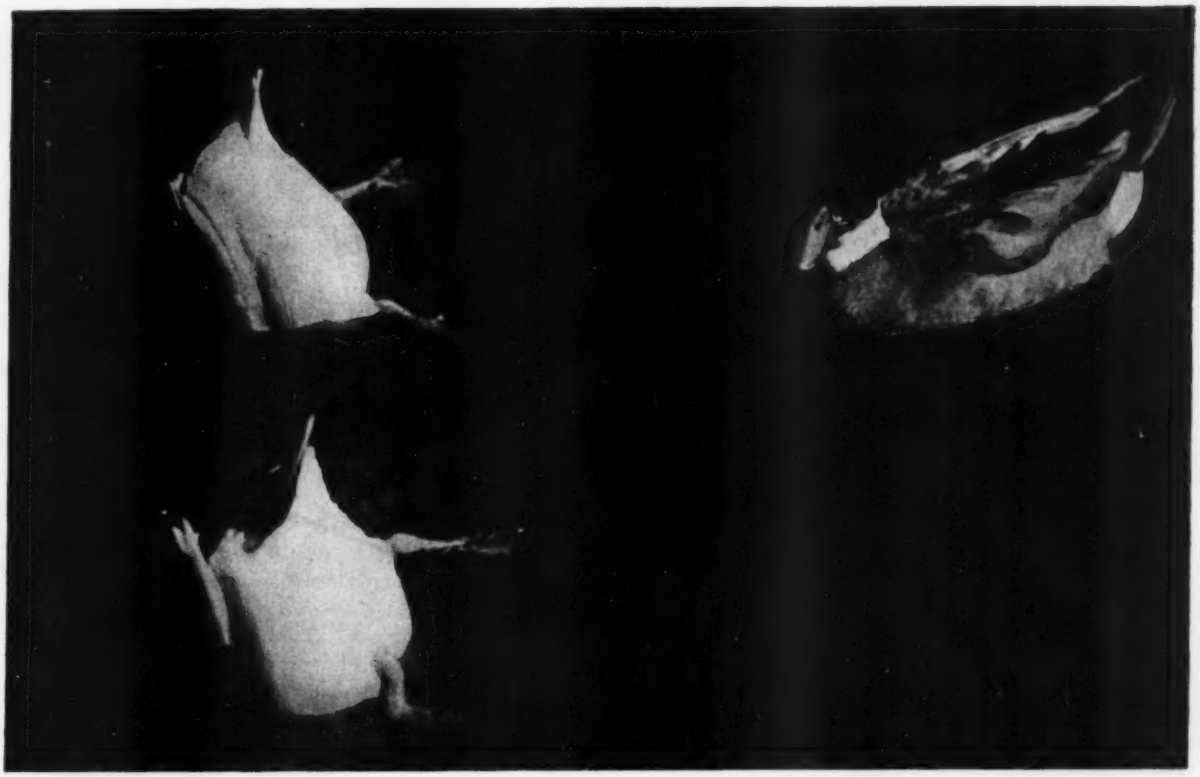
# B. F. PERKINS & SON, Inc.

ENGINEERS AND MANUFACTURERS

HOLYOKE, MASS.

LARGEST MANUFACTURERS OF CALENDER ROLLS IN THE WORLD

# HIDING POWER



Not *partial* but *total* hiding power is desirable in fine coated paper. And Wyandotte Precipitated Calcium Carbonate lends a high degree of opacity to the coated sheet.

This carefully processed chemical has every quality to be desired in a paper coating pigment. It is smooth, uniform and free from grit and abrasiveness. Satisfied users like its ready and easy dispersion in water . . . its printability . . . the high whiteness and brightness it provides.

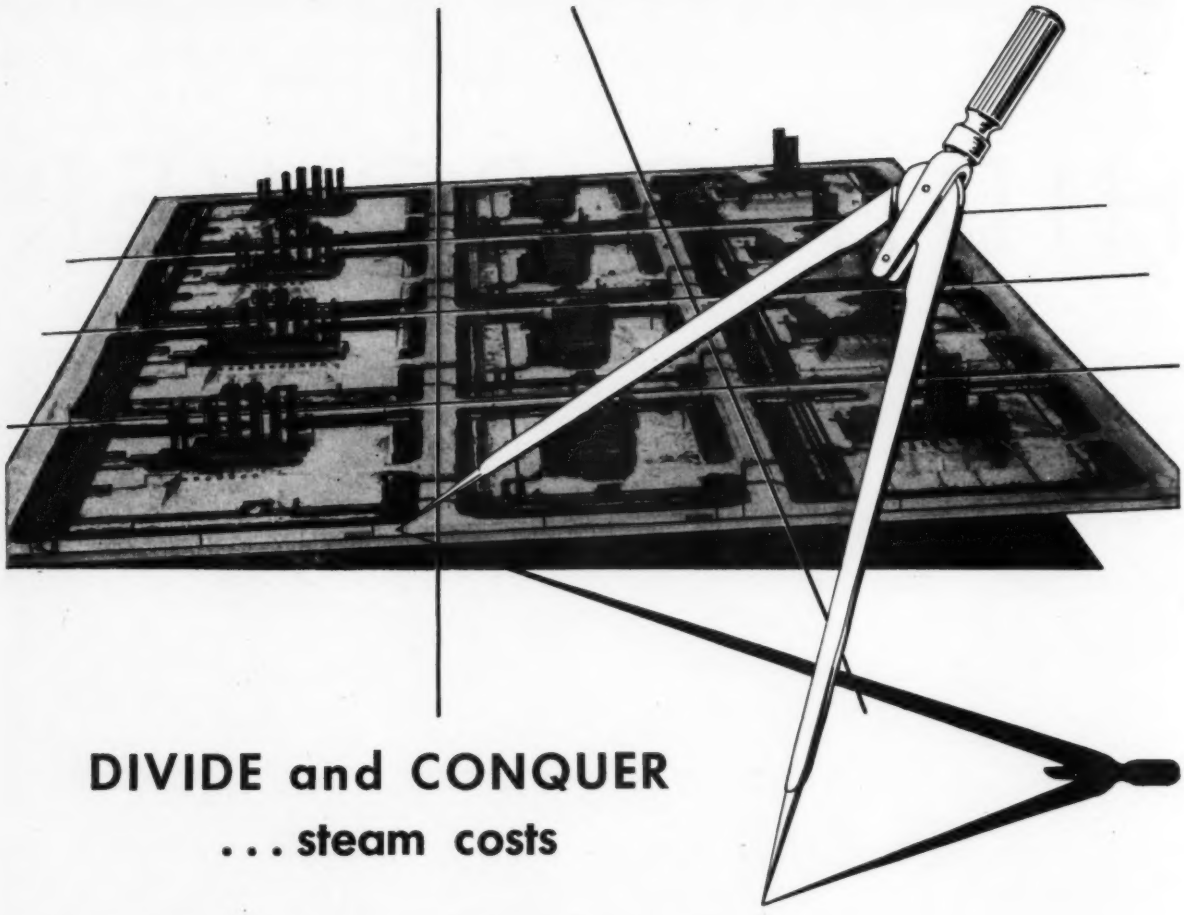
Because it is made of pure ingredients, scientifically processed, Wyandotte Precipitated Calcium Carbonate has properties no natural product has.

If your objective is fine coated paper, it will pay you to look into the advantages of this truly *fine* product. Why not write for information today?

**WYANDOTTE CHEMICALS CORPORATION**
WYANDOTTE, MICHIGAN • OFFICES IN PRINCIPAL CITIES

Wyandotte
REG. U. S. PAT. OFF.

Soda Ash • Caustic Soda • Bicarbonate of Soda • Calcium Carbonate • Calcium Chloride • Chlorine • Hydrogen • Dry Ice • Glycols
Ethylene Dichloride • Propylene Dichloride • Chloroethers • Aromatic Sulfonic Acid Derivatives • Other Organic and Inorganic Chemicals



# DIVIDE and CONQUER
## . . . steam costs

Steam costs are hard to tackle on a plant-wide basis. Responsibility is scattered. Efficiency is unmeasured and wastes go on unnoticed.

Hundreds of plants have proven that the first step in tracking down steam wastes is to isolate steam consumption. With the knowledge of how much steam is going to each processing unit or department, inefficiencies become apparent—wastes can be conquered.

Records produced by the Brown Steam Accounting Flow Meter also form the basis for *complete cost accounting.* The Brown System records rate of flow as well as units, and provides a running total of steam consumed.

The *divide and conquer* approach to steam costs has produced sensational economies in some plants; much more than repaid the investment in practically all plants where it has been put into practice. Why not investigate the Brown Steam Accounting System now?

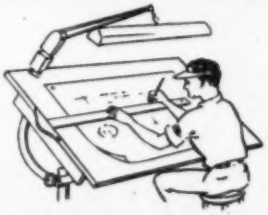
*An informative new 32-page booklet entitled "Brown Flow Meters for Cost Accounting" has just been released. A copy will gladly be sent to you. Write for Bulletin No. 2022.*

**THE BROWN INSTRUMENT CO., 4489 WAYNE AVE., PHILADELPHIA 44, PA.**
**DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR CO.**
*Offices in principal cities of the United States, Canada and throughout the world*

**BROWN** *Advanced Instrumentation* **FOR BETTER PROCESSING** MINNEAPOLIS **Honeywell**

# SPECIALISTS GET BETTER RESULTS

## ...in Architecture and



## ...in VALVE MANUFACTURE

• The architect who designs a good industrial plant has to have qualifications different from the architect who can design a "gem of a home." This is true also of valve manufacture. The best valves for resistance to corrosion and contamination in pipe lines are made by the valve manufacturer who *specializes* in valves of corrosion-resistant alloys. This is the case with Aloyco. We handle nothing but stainless steels and related corrosion-resistant alloys—and we make nothing but valves. Having maintained this high degree of specialization ever since we first started in business, we have acquired a skill which assures the very best in corrosion-resistant valves for our customers.

In our organization are combined a knowledge of the chemistry of corrosion and contamination, the metallurgy of corrosion-resistant alloys and the engineering and manufacturing experience necessary to obtain best results in the fabrication of these materials and the production of valves that are mechanically correct. Consult us on your requirements.

ALOYCO
Series 600
Gear Operated
Gate Valve
with
By-Pass

ALOYCO
Gate Valve
No. 90

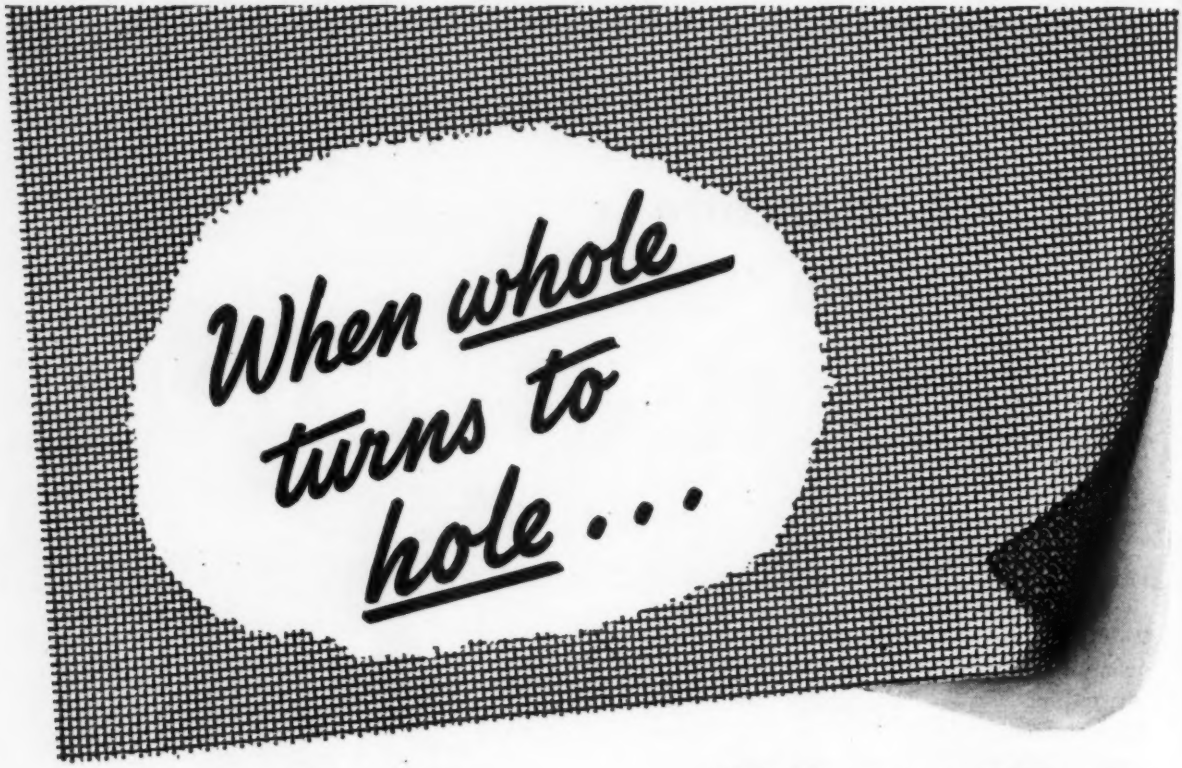
ALOYCO
Angle Valve
No. 43-A

ALOYCO

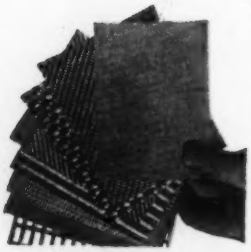
**STAINLESS STEEL VALVES AND FITTINGS**

GATE, GLOBE, CHECK, PLUG, DIAPHRAGM AND BY-PASS VALVES
SCREWED AND FLANGED FITTINGS

ALLOY STEEL PRODUCTS COMPANY, INC.




# Switch to *Screen* and *Filter Cloth* with the l-o-n-g-e-r life



**ALL WEAVES AND MESHES EASY FOR YOU TO WORK!**

Any shape or size that can be made of wire cloth can be easily formed in Monel, Nickel or Inconel. Seams are readily brazed, soldered or welded, and *do not deteriorate in service!*

**This year** thousands of square feet of screen and filter cloth will fail.

It will fail through corrosion...rust...wear...stress...high temperatures.

Plan now to keep *your* wire cloth working longer! How? Just give the job to Monel*, Nickel or Inconel*. They're real "task metals."

Wire cloth of these metals gives you money-saving life under corrosive conditions. It resists most acids, alkalies and salts.

It has extra strength to resist damage by heavy pressures; extra hardness to resist abrasive wear; thermal endurance at high temperatures.

And where product purity must be preserved, you'll get maximum protection from the "task metals."

If you're worrying about their cost. *Don't!* The easier working qualities of these metals enable weavers to produce wire cloth of Monel, Nickel and Inconel at prices comparable to what you are now paying for less durable materials. *In fine sizes it often costs less!*

*33 weavers in U. S. and Canada are ready to supply wire cloth of Monel, Nickel and Inconel. Send for bulletin, "*ESTABLISHED WEAVERS OF WIRE CLOTH.*" It lists addresses; shows typical weaves; illustrates cost-cutting applications. Write to Frank R. Bailey of* INCO.

**THE INTERNATIONAL NICKEL COMPANY, INC.**
**67 Wall Street, New York 5, N. Y.**

EMBLEM OF SERVICE
INCO
TRADE MARK

*Monel** *Nickel* *Inconel**
*Reg. U. S. Pat. Off.

**"Task Metals" for Industry**

ACIDS

AMMONIA

ALUMS

SODIUM COMPOUNDS

PHOSPHATES

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General Chemical Producing Works are located in:

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Edgewater, N. J.
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Front Royal, Va.
Hegewisch (Chicago), Ill.
Jacksonville, Fla.
Johnsonburg, Pa.
Kalamazoo, Mich.
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Marcus Hook, Pa.
Marrero (New Orleans), La.
Medford (Boston), Mass.
Menasha, Wisc.*
Middletown, Ohio
Monroe, La.
Newell, Pa.
Nitro, W. Va.
North Claymont, Del.
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FOR AMERICAN INDUSTRY

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To serve America's chemical consumers most effectively, General Chemical has a chain of 16 regional distributing Stations and 33 producing Works from coast to coast. Each is a strategic supply center carrying extensive stocks of General's basic chemicals packaged in carboys, drums, cases, barrels or bags for prompt delivery.

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All corrosion problems are not the same. The type of stainless steel casting you need for one application may not serve another. That's why you are ahead when you specify Chemalloy.

Chemalloy is not just one alloy. It's a lot of alloys—each suited for a particular job.

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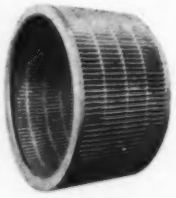
Chemalloy cast filter drum used in processing of penicillin, where stainless steel is a must in maintaining purity.



* * *

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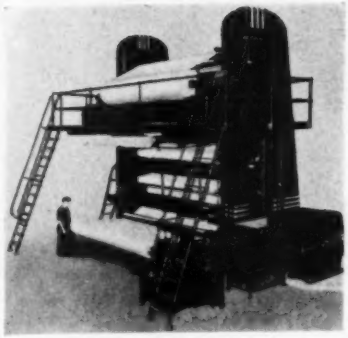
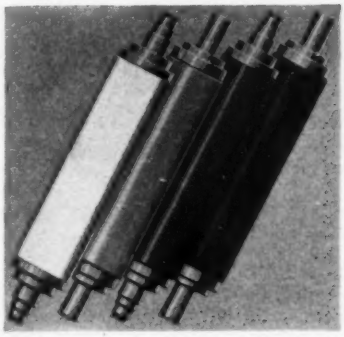
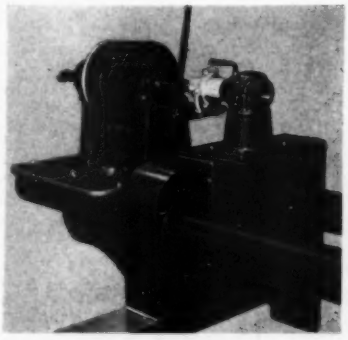


SUPERCALENDERS • Furnished in all sizes from the three roll laboratory model up to full paper machine widths with all the late Appleton features for dependable operation with little down-time.



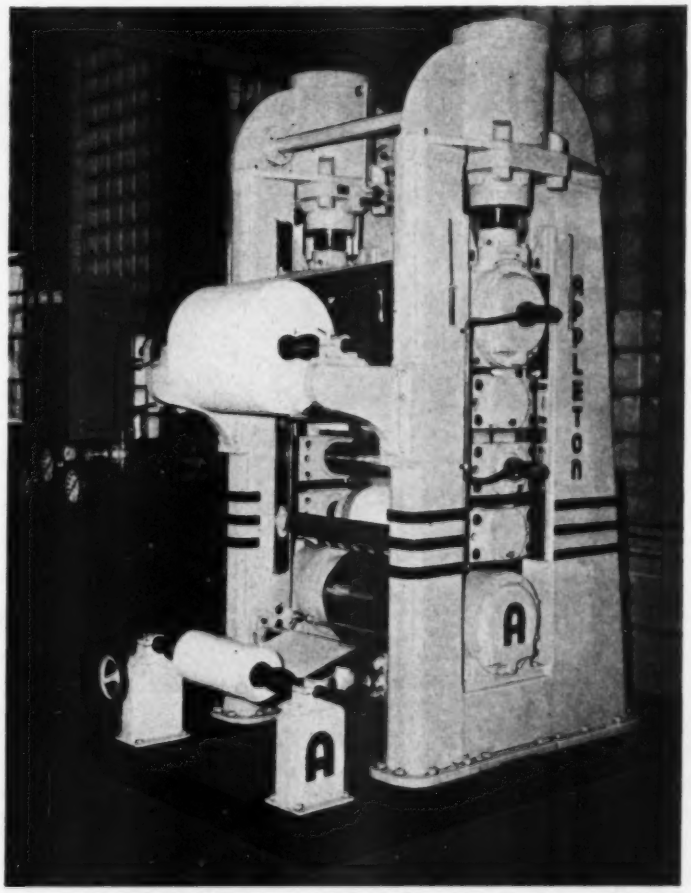
FINISHING ROLLS • The most complete selection in America—a standard or special roll type to give smoothness and finish as required on any grade of paper and at any speed —on any calender.



AUXILIARY EQUIPMENT • A full line of accessories for high speed finishing—hydraulic pressure and oiling systems, control panels, unwind and windup reels, winders, brakes, roll trucks, etc.

# *Fits an Important Place in the Mill Manufacturing High Finish Papers*

Technicians in mills manufacturing high finish papers have their special problems in control, research and development of paper coating and finishing. The Appleton Experimental Supercalender is special equipment just for them. This small size super stack is built for close and accurate control of trial runs and duplicates mill operating conditions and results. It has all of the advanced features of Appleton mill Supercalenders for smooth, vibrationless operation and precision, finger-tip control—all of the latest mechanical and electrical advancements for fine performance and finishing at modern high speeds and high pressures.




## APPLETON
## Experimental Supercalender

***COMPLETE***
**SUPERFINISHING EQUIPMENT**
**for the Paper Industry**

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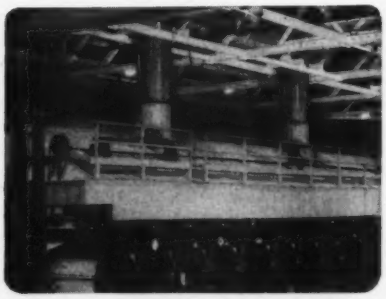
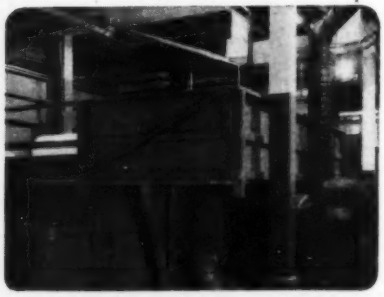
# 6 common conditions where *WOLMANIZED PRESSURE TREATED LUMBER protects against DECAY and TERMITES

1. Ground moisture and rain held in joints, etc., of outdoor structures.

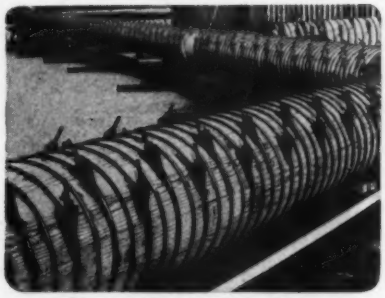
2. Roof decks subject to rapid decay caused by excessive humidity.



3. Where steam and vapor from industrial processes are prevalent.



4. Mixing tanks and equipment exposed to water contact.



5. Where combinations of outdoor exposure and water contact are present.

6. Walls and floors of bins subject to decay caused by moisture condensation.

## This Treatment COSTS LESS Than "Replacement-Labor"

Actual service records, available to you, show that "Wolmanized" lumber outlasts ordinary wood by as much as 3 to 5 times.

That's because it is pressure-treated with special chemical salts to give lasting protection against wood-decay and termites.

And the extra cost of using Wolmanized lumber in the first place is actually less than the cost of replacement labor alone, on wood which has failed prematurely.

Here is a true economy which will reduce your maintenance costs and give you sounder buildings. It offers you particular savings under conditions such as those shown above where wood is subjected to moisture and ground exposure—ideal conditions for decay and termites.

Wolmanized lumber is clean, odorless, paintable and non-corrosive to metals.

For complete information and copies of actual performance records, write today to American Lumber & Treating Company.

**The latest information on WOLMANIZED pressure-treated LUMBER**

*Learn more about this money saving pressure treated lumber. Get all the facts and figures on how Wolmanized pressure treated lumber resists decay and termites.*

*Write today for this new booklet.*

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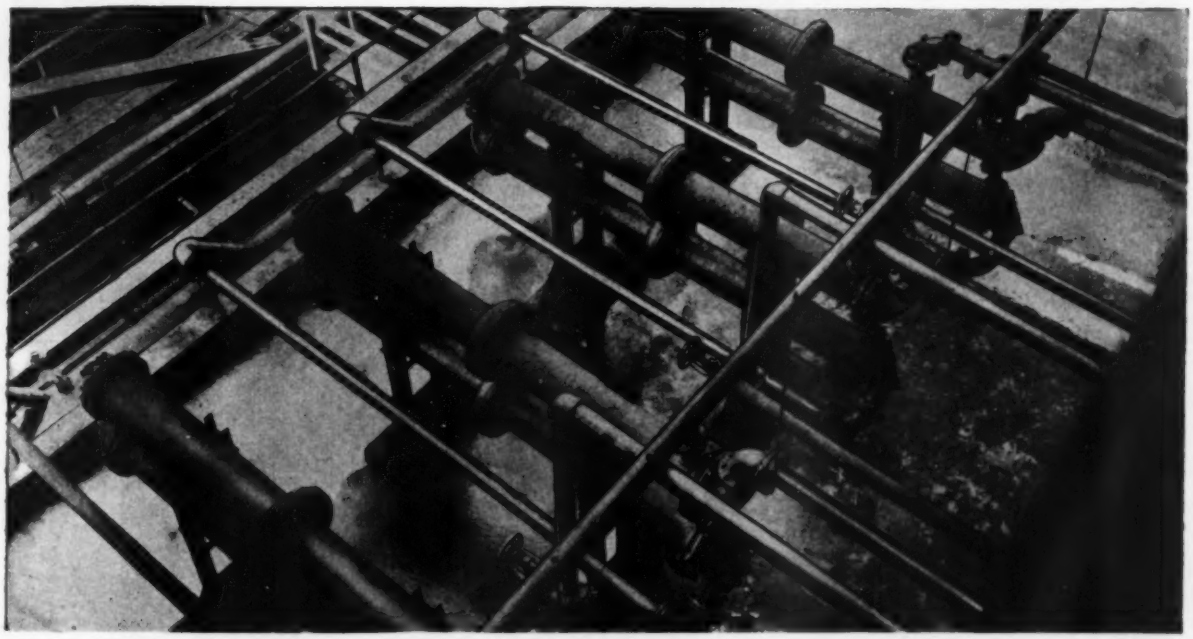
# *ESCO* STAINLESS $SO_2$ GAS COOLERS for more efficient cooling...

HOT WEATHER need not mean excessive acid loss. Every year many of America's pulp mills overcome this problem by using *ESCO* stainless steel $SO_2$ gas coolers.

These coolers are being used in increasing numbers because of the following advantages:

- *Minimum space required*—less than other coolers of the same capacity.
- *Easy, flexible installation.* 100 sq. ft. units can be added or removed easily as varying conditions require. May be installed in parallel or in series.
- *Eliminates expansion packings* by using bellows type expansion joints. Stress relieved.
- *Resists corrosion.* All parts in contact with gas or acid are made of *ESCO* Alloy 45 or Type 316 Stainless Steel.

*ESCO* stainless $SO_2$ gas coolers can be delivered on short notice—before hot weather begins. Order from your nearest *ESCO* representative, or write us direct.



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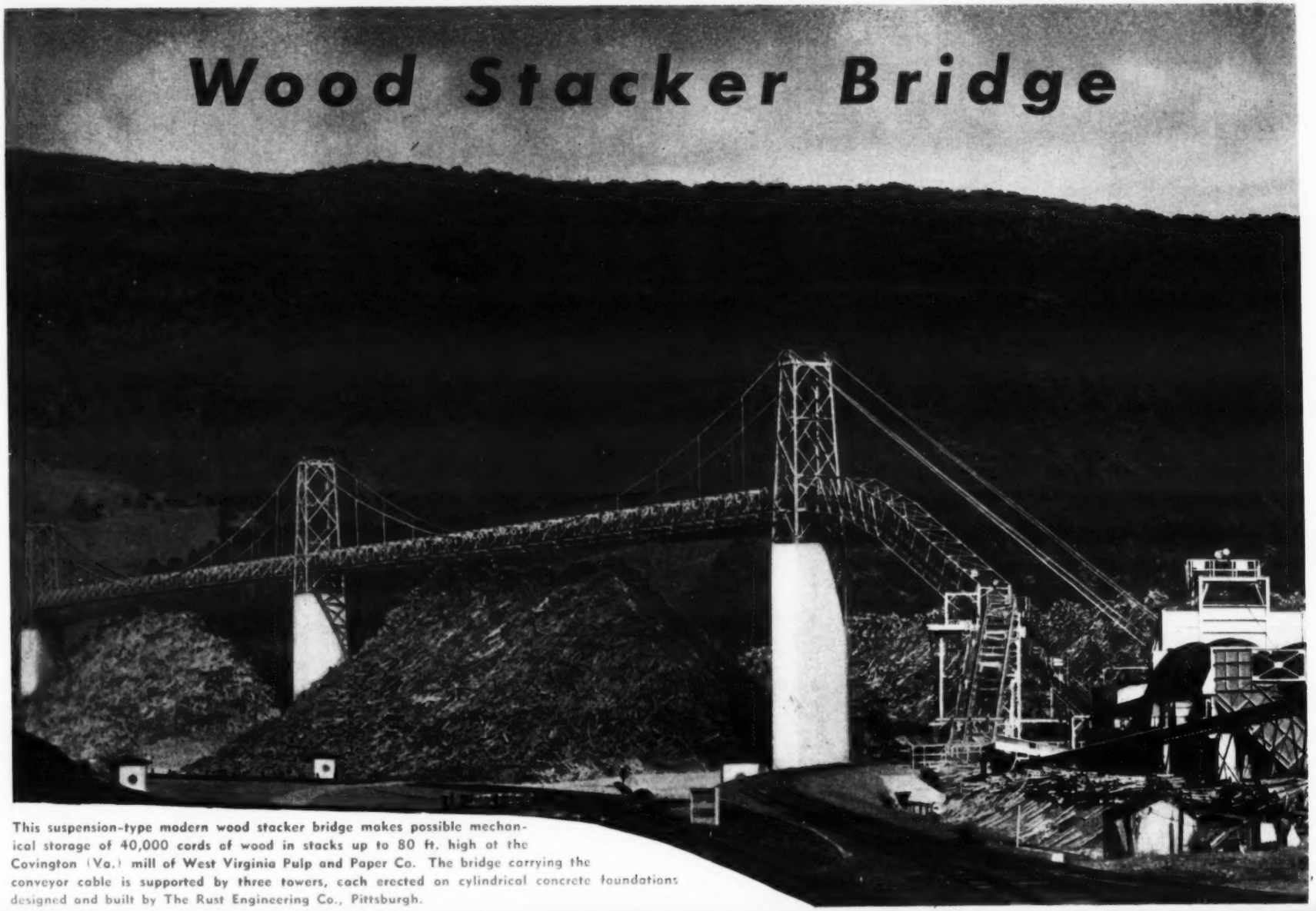
# Wood Stacker Bridge



This suspension-type modern wood stacker bridge makes possible mechanical storage of 40,000 cords of wood in stacks up to 80 ft. high at the Covington (Va.) mill of West Virginia Pulp and Paper Co. The bridge carrying the conveyor cable is supported by three towers, each erected on cylindrical concrete foundations designed and built by The Rust Engineering Co., Pittsburgh.

designed and built by The Kahr Engineering Co., Pittsburgh.

# TRADE WINDS

# Trends...
# Pulp and Paper Mill Design

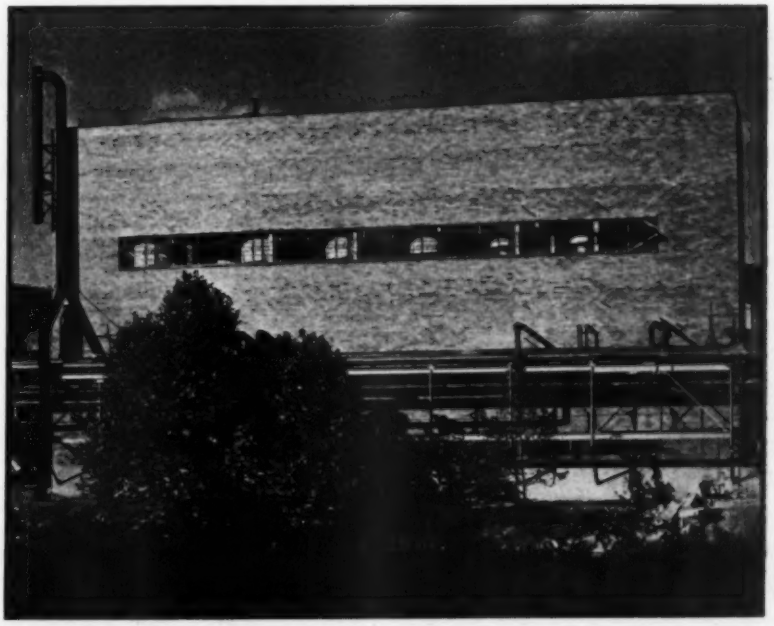
▸▸▸ PROCESS DEVELOPMENT in the pulp and paper industry making possible more and better products has, in the past decade, caused significant design changes in new and modernized mills, according to The Rust Engineering Co., Pittsburgh, one of the nation's leading designers and builders of pulp and paper mills.

In adopting most of these changes owners have sought more economical operations through scientific application of chemical and mechanical advances and, to an appreciable degree, have been influenced by American industry's new concepts of personal and public relations.

New production methods which have had the most notable effect on design of paper mills are installation of blow tanks and washers in place of diffusers; precipitators and evaporators to extract chemicals from flue gases; more mechanization of wood handling systems; more kraft pulp bleach plants, and improvements in the lime calcining process.

Most universally accepted of these major changes is the installation of blow tanks and washers to replace diffusers—bringing modern pulpmaking nearer a completely continuous process. This development—found in nearly all new mills—has been the subject of a considerable number of modernization projects.

Principal economic advantages of this change are efficient recovery of a greater percentage of black liquor solids and the use of less hot water, simplifying waste disposal problems. By counter-current washing, all the spent liquor removed from the pulp is collected and sent to the evaporators, completely eliminating any discharge of this waste to sewers.



*New evaporator building, of structural steel frame and tile walls, which houses two sextuple effect evaporators at West Virginia Pulp and Paper Company's Covington (Va.) mill*

One of this type of installation was made by Rust in 1940 for Hollingsworth and Whitney Company, at Mobile, Alabama. Later installations were made for Union Bag and Paper Corporation, Savannah, Georgia, and in a new mill just completed for Brown Company, Berlin, New Hampshire.

A new development in the black liquor recovery process having wide acceptance is installation of electric precipitators and cascade type evaporators making possible the recovery of chemicals and usable heat from flue gases before the gases are discharged to the atmosphere. Through these means, a high percentage of chemicals previously lost through the stack may be reused; and an additional savings is introduced in the recovery of heat from the flue gas. Further, these installations have greatly reduced the

nuisances created by salt cake dust and other chemicals discharged by the recovery units.

Improved mechanical methods of wood handling have been adopted to take advantage of the possible relative economy of operations. Engineering studies often show that present labor costs justify greater capital investment in the wood yard. Mechanized systems being installed make use of locomotive and caterpillar type cranes and overhead electric bridge cranes in combination with conveyor systems.

A new mechanical wood handling installation at the Covington, Virginia, mill of West Virginia Pulp and Paper Company, uses a cable conveyor and conveyor bridge. The suspension type bridge carrying the conveyor cable is supported by three towers, each erected on cylinderical concrete foundations designed and built by Rust. This bridge makes possible mechanical storage of 40,000 cords of wood in stacks up to 80 feet high.

To meet increased market demands for bleached kraft stock there has been a significant increase in the number of bleach plants being built at kraft mills. This trend, in turn, has meant an increase in the number and size of water treatment and supply systems.

To serve the new bleach plants many owners have ordered extensive improvements designed to assure a greater supply of high quality water. At present Rust is engaged in a one-million dollar project for this purpose at Hollingsworth and Whitney's Mobile (Ala.) mill. At the Waterville (Maine) mill of the same company, additions are under way which will more than double the bleach plant capacity.

Developments in the lime calcining process have resulted in longer lime kilns. The longer kilns have brought about fuel and maintenance savings which justified the greater installation cost. The extended retention time of the lime in the longer kiln makes possible lower hot-zone temperatures and lower flue gas temperatures reducing fuel consumption per ton of lime calcined. Lower temperatures also show a beneficial effect on maintenance costs of the longer kilns. Many mills previously equipped with kilns 180 ft. to 200 ft. long are now using kilns 250 to 300 ft. long.

Design features which show management's increased awareness of the value of good personnel relations include employee facilities far beyond the standards of a decade ago. Locker rooms and shower rooms in new mills or modernized mills have advanced to individually ventilated lockers and shower rooms planned for greater ease of cleaning. More thought is being given to plant cafeterias, and they are either included or are proposed as the first addition to plants now being designed and constructed.

▼

▶▶▶ LIGHTNING was blamed for a fire which destroyed the general store which served employees of the Wausau Paper Mills Company at Brokaw, Wisconsin, five miles north of Wausau. The store was the main source of supply for the village of 500. Loss was estimated at $30,000.

▼

## AUSTRALIAN PAPER NEWS

### Australian Newsprint Imports

Official figures issued in Canberra show that the January import of rolls newsprint was 16,799 tons, valued at £521,858 in Australian currency. This is an increase of 4,551 tons on the previous month and of 3,529 tons on January, 1947. Imports of printing paper from a dozen countries showed a big rise in the total of Finland, with Sweden and the United States second and third. The great majority of papers from these three countries were scheduled under "Printing paper, n.e.i." which means that they could possibly be utilized as newsprint at high rate.

### Right to Levy upon Newsprint Stocks

*Newspaper News* in its April issue reports: "Heavy newsprint rationing of metropolitan and Sunday newspapers has raised the question of Federal Government advertising, including loan issues. In order to meet this difficulty the Government has decided to allot an additional 1½ per cent of newsprint to metropolitan and Sunday papers. Press executives immediately pointed out, however, that this was a blanket provision which made recipients responsible for printing whatever Government advertising might be sent in. The official decision was then made that if the newsprint Department of the Customs and the director of Advertising were convinced of the fairness of a larger amount, the 1½ per cent could be raised to 2½ per cent in any particular case. While this allotment may cover Government advertising, the newsprint in question will be taken out of existing stocks in Australia, which will add to the hazard of the present paper position by reducing the margin of safety."

### Associated Pulp and Paper Mills, Ltd.

Associated Pulp and Paper Mills, Ltd., announced that negotiations were proceeding with Thomas Owen & Company, Cardiff, for the establishment of a mill designed to make vegetable parchments, glassines, greaseproof and other specialty papers. The mill will possibly be in the proximity of A.P. & P.M. own mills at Burnie, Tasmania and it is anticipated that the companies will run the new mill on a 50 per cent basis. (The old-established English firm, Thomas Owen & Company, has taken over a former gun-cotton factory at Ballarat, Victoria and will shortly commence the manufacture of paper there.)

### Australian Newsprint Mills, Ltd.

A recent public issue of 4½ per cent £1 preference shares in Australian Newsprint Mills Ltd., Tasmania, closed within three minutes heavily oversubscribed. Applications for the 200,000 available shares represented £2,529,150. The total issue of 1,000,000 shares has been divided as follows: Underwriters taking 300,000, shareholding newspaper companies or their nominees 500,000, and 200,000 were offered to the public, of which 13,200 will be alloted to 42 employees at the mills.

At least 80,000 long tons a year by 1950 is the object by Australian newsprint Mills, Ltd. Expansion will include a second paper machine, a new woodmill, additions to grinders, screen room equipment, beaters, storage tanks, new logging roads and equipment.

### New Zealand Paper Industry

It has been reported that after Mr. Chifley, Australian Prime Minister, had returned to Australia from his holiday in New Zealand, when he discussed with Mr. Fraser, Prime Minister of New Zealand, the supply of printing and writing papers to the Commonwealth, he stated that the needs of Australia, and the ability of New Zealand, after the erection of the paper mills to supply those needs were agreed upon. The cabled report of Mr. Chifley's statement brought a statement from the Commissioner for Forests, Mr. Skinner, discounting the suggestion. The purpose of the statement is not evident, since it is general knowledge in Australian and New Zealand paper trade circles that the establishment of a paper mill by the New Zealand Government has been discussed. It is further known too, that two of the major forestry companies are preparing plans for the establishment of mills to manufacture paper, and that one company has already ordered plant for the manufacture of paper, and that the Australian mills are prepared to take all the pulp that can be supplied. It appears that the great enterprise of establishing the paper manufacturing mills in New Zealand will be achieved by private enterprise.

# PAPER · · · America's 6th Industry

CENTENNIAL SPOTLIGHT 1848-1948
In this 100th anniversary year as Machine Builders for the Paper Industry, Puseyjones points with pride to outstanding post-war installations. In the spotlight . . . 168" Single-Cylinder High-Speed Felt Machine for Consoleum Nairn Inc., Cedarhurst, Md.

# NEW LIFE FOR AUTO SEAT COVERS

(NEWS ITEM: *Plastic-coated paper twine is being woven into automobile seat cover fabric.*)

Now you can brighten up the life of your car with seat covers made of paper twine. Woven from dyed sulphate paper coated with plastic lacquer, these new serviceable automobile seat covers are stronger, more flexible than ever before possible. Practically color-fast, plastic-coated Fibre Fabric is obtainable in a wide variety of colors and patterns. Can be cleaned with a damp cloth. We will gladly supply manufacturer's name on request.

Paper for cooking . . . paper for polishing . . . paper for steam pressing . . . new uses for paper calling for new standards of lightness and toughness, new standards of quality in performance. New responsibilities—new opportunities for the Pulp and Paper Industry.

The Puseyjones Organization is now devoting itself completely to the design and construction of Paper-Making Machinery built to new high standards of speed and efficiency, and to the modernization of existing machines. Additional capacity in Metals Fabrication is now available through conversion of facilities formerly devoted to the building of ships.

Puseyjones Engineers will welcome the opportunity to work with you in solving production problems.

**THE PUSEY AND JONES CORPORATION**
**Established 1848. Builders of Paper-Making Machinery**
**Wilmington 99, Delaware, U. S. A.**

THE SIGN OF TRADE MARK SUPERIOR QUALITY

## NEW MILL OF ALABAMA PULP AND PAPER COMPANY GOES INTO PRODUCTION

A veritable city of kraft paper operatins went into production with the recent opening of the large kraft project of St. Regis Paper Company at Pensacola, Florida.

At this "kraft center," the output of the Florida Pulp and Paper Company plant (in operation since 1941), has been joined by that of the new Alabama Pulp and Paper Company mill. These two plants combine with the new bag plant to provide one of the country's largest integrated kraft operations—an outstanding example of conversion from managed woodland to pulp, to paper, to multiwall bags.

Roy K. Ferguson, president of the St. Regis Paper Company, and a group of representative bankers, insurance men, publishers, and industrialists, attended the official opening and inspected the new plant.

Less than two years ago, St. Regis entered the kraft industry of the South when it acquired the capital stock of the Florida Pulp and Paper Company from James H. Allen and his associates in exchange for St. Regis stock. St. Regis also acquired the Alabama Pulp and Paper Company, which was engaged in building a kraft paper mill adjacent to the Florida Pulp and Paper Company mill.

The new Alabama mill, which has just gone into production, was specially designed for the manufacture of special, heavy-duty kraft paper and has a rated capacity of 250 tons a day. Capacity of the Florida mill is in the neighborhood of 200 tons of kraft paper daily, and the combined output of the two mills is sufficient to make 500 million multiwall bags annually.

*Roy K. Ferguson, president of St. Regis Paper Company*

In pointing out that the multiwall paper bag is now being used as a container for industrial shipments of over 400 commodities, Mr. Ferguson at a testimonial dinner here, stressed that there are still available great unexploited markets for its use.

The new bag plant when in full operation will have a capacity for making 250 million multiwall paper bags annually, and is so designed that at a later date it can be expanded to a capacity of half a billion bags annually. In addition to its multiwall bag facilities, the plant will have a capacity to produce a million five- and ten-pound consumer sugar bags daily.

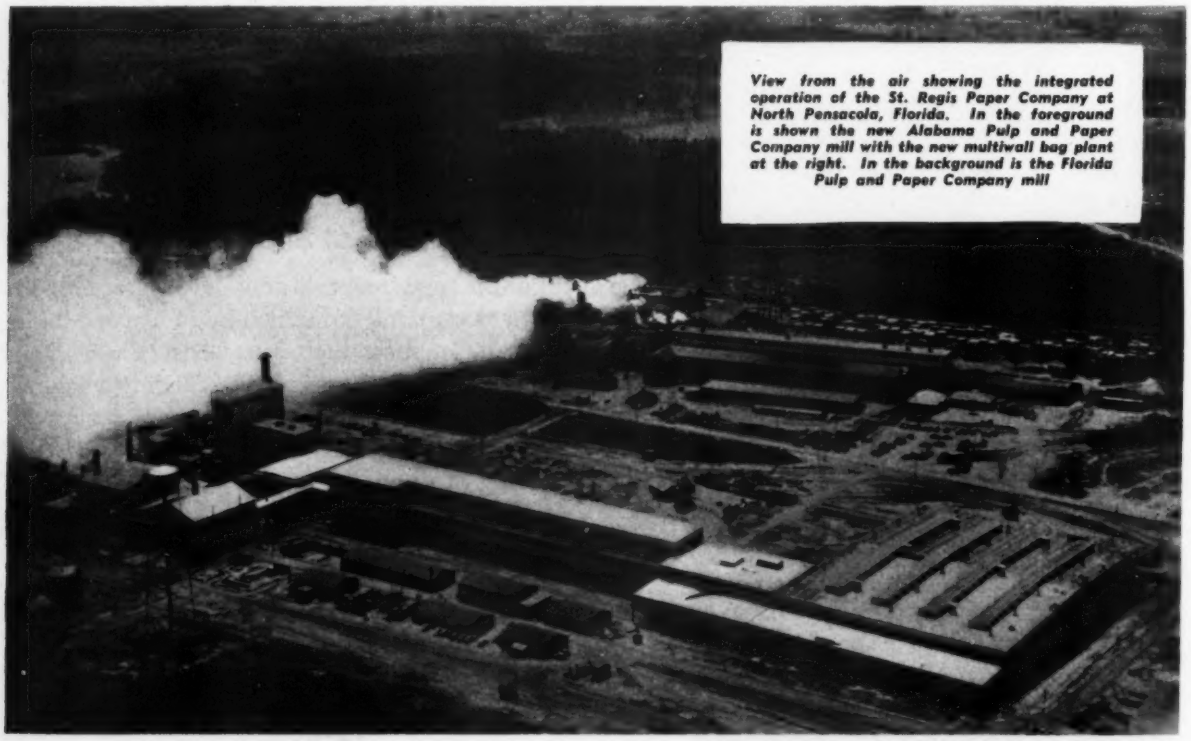
▼

## FOREST EXPERT REPORTS WHITE PINE IS MAKING COMEBACK IN WISCONSIN

White pine is making a marked comeback in Wisconsin, according to the annual report of T. F. Kouba, who is in charge of state blister rust control.

Mr. Kouba said the white pine acreage in Wisconsin has increased more than 100,000 acres in the past 10 years. At the present time, the state has about 430,000 acres of second growth white pine where the stand is sufficient to warrant protection against blister rust. Of this acreage, 394,000 are natural growth and about 36,000 are planted.

The state and private individuals or firms own about 360,000 acres of pine lands. The U. S. forest service owns about 30,000 acres and the U. S. Indian service the remaining 40,000 acres. The estimated value of the Wisconsin white pine is now about $37,000,000.



*View from the air showing the integrated operation of the St. Regis Paper Company at North Pensacola, Florida. In the foreground is shown the new Alabama Pulp and Paper Company mill with the new multiwall bag plant at the right. In the background is the Florida Pulp and Paper Company mill*

# *Sutherland* FIRST

About twelve years ago, the "then" astounding news leaked out that kraft paper was being made from stock prepared alone by Sutherland Continuous Beaters and Refiners. It had never been done before; some people didn't believe it, but it's been true ever since.

The original 14 Sutherlands in this mill are still in use, one more having been recently added. This mill produces well over 500 tons daily, their output ranging from 30 to 70 lb. bag, through 25 to 80 lb. wrapping, to 42 to 105 lb. liner board, and other specialty grades.

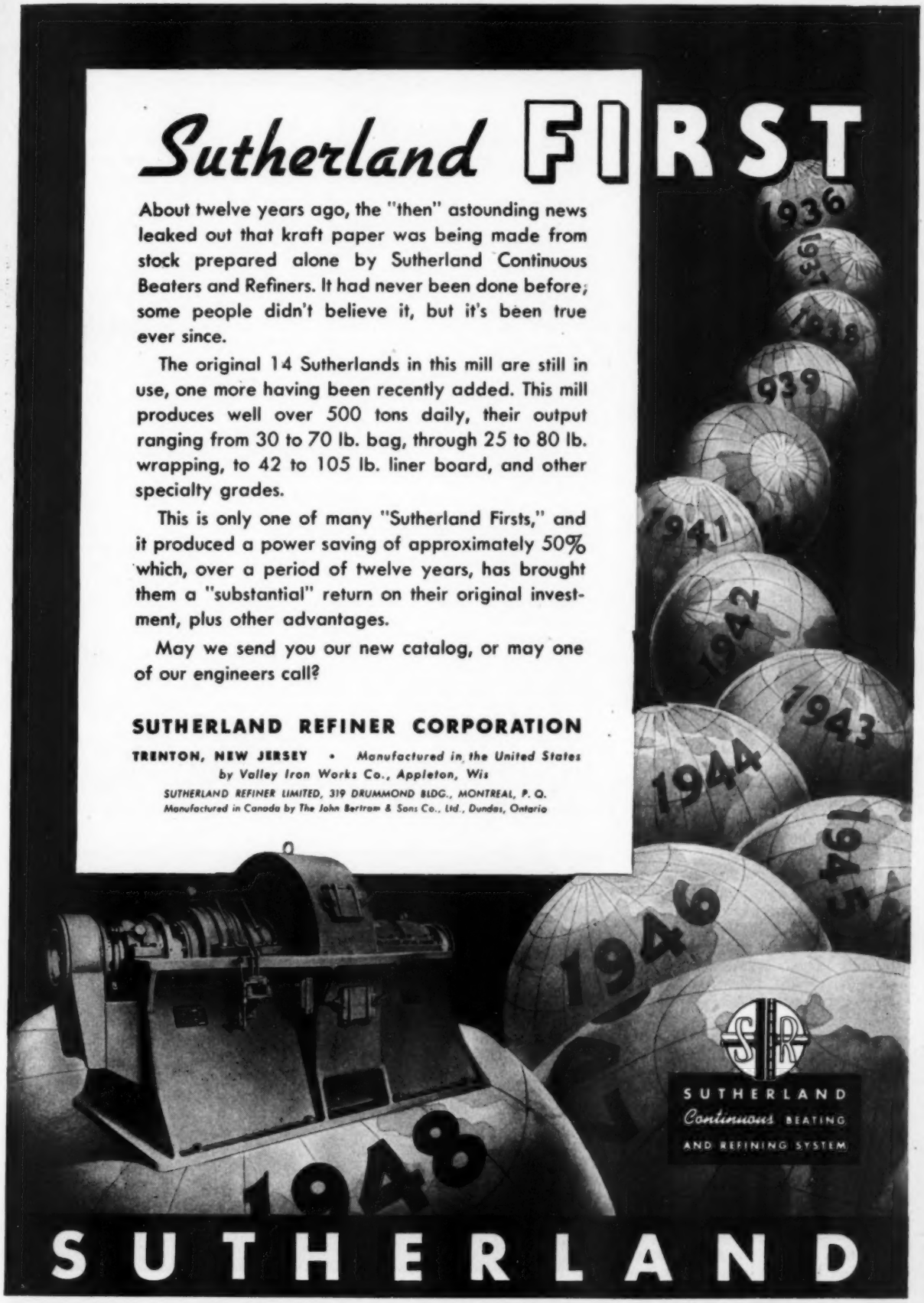
This is only one of many "Sutherland Firsts," and it produced a power saving of approximately 50% which, over a period of twelve years, has brought them a "substantial" return on their original investment, plus other advantages.

May we send you our new catalog, or may one of our engineers call?

**SUTHERLAND REFINER CORPORATION**

**TRENTON, NEW JERSEY** • *Manufactured in the United States by Valley Iron Works Co., Appleton, Wis*

*SUTHERLAND REFINER LIMITED, 319 DRUMMOND BLDG., MONTREAL, P. Q. Manufactured in Canada by The John Bertram & Sons Co., Ltd., Dundas, Ontario*




**SUTHERLAND**

Mr. Kouba said white pine acreage is expected to continue to increase. Many of the trees are now reaching seed-bearing age. Aspen trees serve as a "nurse crop" for young white pine, and as the aspens reach maturity, are harvested or are killed by disease, the pines take over.

Although blister rust is the most serious disease threatening white pine, the disease can be controlled, and control work is being done by owners of the pine in co-operation with the blister rust control service.

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## WISCONSIN PAPER INDUSTRY TO PROVIDE MOVIE FOR CENTENNIAL EXPOSITION

The Wisconsin paper industry will contribtue a 30 minute motion picture for use at the State Centennial Exposition at Milwaukee, next August 7 to 29.

According to A. C. Gilbert, of Menesha, the movie will show the size, scope and importance, of the paper and related industries in the state; why the industry came to Wisconsin and why it thrived there; the diversified career opportunities of the industry, and the importance of paper to everyone. The movie will be shown in a little theater called "The Paper Theater."

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## NEKOOSA-EDWARDS COMPLETES ITS NEW FINISHING DEPARTMENT

Beginning of operations in its new Nekoosa finishing department has been announced by the Nekoosa-Edwards Paper Company, Port Edwards, Wisconsin. Finishing personnel and equipment are now housed in new modern quarters south of, and adjacent to, the Nekoosa shipping department.

The new finishing department building is a two-story brick building measuring 110 by 130 feet and is of a design harmonizing in architecture and style with other buildings making up the Nekoosa pulp and paper mills. Ample lighting is supplied through the use of glass block windows throughout the building, and ventilating equipment is of the very latest and most efficient design.

The new building provides increased floor space for the greater quantities of paper being converted to sheets and cut sizes in the Nekoosa mill. It also provides the needed space for expanding the machine room by vacating the area at the dry end of the paper machines where the department was formerly located.

The first floor or sub-ground level of the new building is to be used for wrapper and carton storage, and for the production of cut sizes and similar converting operations. The second floor houses the multiple-roll sheeters and guillotine ream cutters. Also provided is ample space for sorting and counting operations and the converting of special items. A new overhead crane operates above this floor for handling sheet rolls.

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## SIX MILLS IN KALAMAZOO AREA PLAN COMMERCIAL WASTE DISPOSAL PLANT

Under a plan approved by the Stream Control Commission of the state of Michigan, a commercial-type waste disposal plant may be constructed at one of the paper mills in the Kalamazoo area. This plant, which according to the plan would probably handle 500,000 gallons daily, would be constructed along the lines of the pilot plant operater last year at the Michigan Paper Company, Plainwell, Michigan (Cf. P.I. and P.W. Jan., 1948).

At the hearing before the Commission in Lansing on April 20 were representatives of six paper mills. The cost of the plant, its location and proportional share of the expense to be borne by each of the mills are yet to be determined. Tentative plans are to be presented to the stream control commission within 90 days by a special committee designated at the meeting. On this committee will be representatives of the six affected mills:

Kalamazoo Paper Company
St. Regis Paper Company
Allied Paper Mills
Rex Paper Company
Michigan Paper Company
Watervliet Paper Company

Milton P. Adams, chairman of the State Commission, will serve on the exploratory committee in an advisory capacity. Another member probably will be Philip F. Morgan, resident engineer for the National Council for Stream Improvement.

One proposal has been advanced that the disposal plant be built at one of the small mills and then be sold to that mill after the test period. It was suggested that a corporation might be formed to handle the commercial-scale test plant.

Henry W. Gehm, technical advisor for the National Council, states that "three serious problems still remain. In the order of their importance these are:

1) Disposal of sludge, which exceeds mill production in tonnage

2) Reduction in waste volume by changes in manufacturing processes

3) Providing an aeration system that is not subject to frequent clogging"

Construction of the commercial-type deinking waste disposal plant was suggested by the mill representatives. James W. Wise, vice president of the Kalamazoo Paper Company, who presented the mill operators' proposal for the plant, said his group had no details or specific plans to offer immediately.

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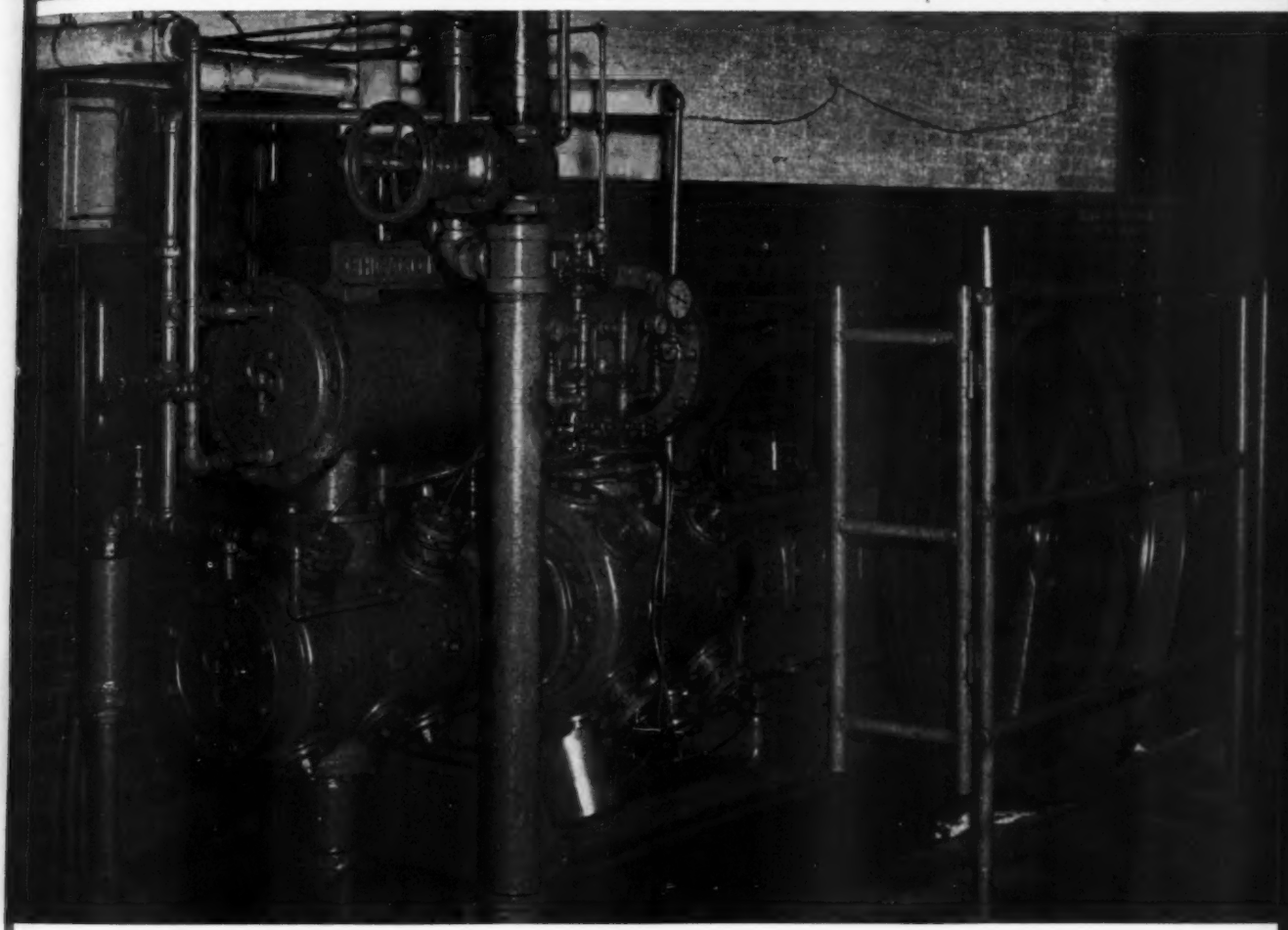
## B. C. FORESTRY LICENSE GIVEN CELANESE CORP.

Plans of Celanese Corporation of America for the construction of a cellulose plant in Canada were advanced on May 4 when Columbia Cellulose Company, Ltd., a subsidiary, received from the government of British Columbia, a forest management license for

*New finishing department, Nekoosa-Edwards Paper Co., Port Edwards, Wis.*



# ...and after that, no cleaning in 11 years!

A midwest pump manufacturer was having carbon-deposit trouble with the valves of the compressor shown above. Frequent cleaning was compulsory. Maintenance cost was high, compressor efficiency low.

"Make a test with Stanoil. Its high stability should lick your problem," said a Standard Oil Lubrication Engineer. The test was made . . . it has grown into 11 years of service (24 hours a day during the war) . . . and *no cleaning has been required in all that time!*

Clean operation with Stanoil results from its high stability plus an exceptionally effective oxidation inhibitor. Stanoil is a multi-purpose oil, that can replace many special and costly oils in your plant.

At the right are listed the principal types of equipment where Stanoil can save you money and maintenance time. A Standard Oil Lubrication Engineer will be glad to help you make a test. Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

**For improved lubrication of . . .**

- **Compressors and Ice Machines**
- **Power Transmissions**
- **Hydraulic Turbines**
- **Gas Engines**
- **Steam Engines**
- **Steam Turbines**

**STANOIL**
**Industrial Oil**

**STANDARD OIL COMPANY (INDIANA)**

STANDARD

extensive tracts of forest land in the province. This is the first license to be issued under the amendment to the Forest Act, authorized at the 1947 session of the British Columbia Legislative Assembly.

Under this license, logging will be regulated so that forest resources will be perpetuated through scientific management and planned afforestation. The tract of land covered by the management license is in the Prince Rupert forest district and includes parts of the watershed areas of the Skeena and Nass Rivers.

The forest reserve allotted will provide a sustained wood supply for the cellulose plant on Watson Island, near Prince Rupert, which possesses excellent deep water wharfage and transcontinental rail and highway facilities. The license was signed by Hon. E. T. Kenney, Minister of Lands and Forests, on behalf of the government of British Columbia.

Preparation of the cite of the cellulose plant is nearing completion and construction is scheduled to begin shortly. It is estimated that approximately two years will be required to complete the project. Present plans call for a production capacity of 200 tons daily of highly purified cellulose.

▼

## FINANCIAL

▶▶▶ THE APRIL UPSURGE of securities carried prices for stocks and bonds to the highest figures of the year and closely approaching the high point of July, 1947. Paper mill issues followed the trend in nearly every instance, closing on April 24 at prices above those of a month before.

*Brown Company*—Net earnings in 1947 were $2,837,682 as against $1,593,982 in 1946.

*Champion Paper & Fibre Company*—Net income for twelve weeks ended February 1 was $2,115,767 as against $1,340,546 for the comparable period a year ago.

*Consolidated Water Power and Paper Company*—Net income in 1947 was $4,068,559 as compared with $2,789,248 in 1946.

*Container Corporation*—Net income for three months ended March 31 was $2,112,830 as compared with $3,182,379 for the same period in 1946.

*Robert Gair Company*—Net earnings for three months ended March 31 were $1,393,290 as against $1,405,416 for the same quarter in 1946.

*Gaylord Container Corporation*—Net income for the year ended December 31 was $9,528,727 as against $5,046,022 in 1946.

*Great Northern Paper Company*—Net income for the year ended December 31 was $4,102,883 as compared with $2,364,413 in 1946.

*Hammermill Paper Company*—Net income in 1947 was $1,467,511 as compared with $940,205 in 1946.

*Hinde & Dauch Paper Company*—Net income in 1947 was $3,909,386 as compared with $1,749,877 in 1946.

*International Paper Company*—Net income for 1947 is officially reported as $54,396,550 as compared with $31,179,048 in 1946.

*Kimberly-Clark Corporation*—Net earnings in 1947 broke all records, with a total of $6,431,580 resulting from an increase of 37 per cent in sales as compared with 1946.

*Masonite Corporation*—Net earnings for six months ended February 29 were $3,271,229 as against $1,302,519 for the comparable period in the previous fiscal year.

*Mead Corporation*—Net income for the year ended December 31 was $5,685,386 as compared with $3,449,309 in 1946. Income for twelve weeks ended March 21 was $1,127,882 as compared with $1,254,728 for the comparable period in 1946.

*Minnesota & Ontario Paper Company*—Net income for 1947 was $1,500,675 as compared with $1,204,473 in 1946.

*National Container Corporation*—Net income in 1947 was $10,913,359 as compared with $5,605,896 in 1946.

*National Gypsum Company*—Net earnings for the first quarter were $1,521,933 as compared with $1,314,617 for the same period a year ago.

*Nekoosa-Edwards Paper Company*—Net earnings for the year ended December 31 were $2,663,632 as against $1,023,130 in 1946.

*Oxford Paper Company*—Net income in 1947 was $2,990,906 as compared with $1,842,545 in 1946.

*Paraffine Companies*—Net income for three months ended March 31 was $857,610 as compared with $835,343 in the same period a year ago.

*Rayonier, Inc.*—Net income for the quarter ending March 31 was $2,460,679 as compared with $1,789,186 in the first quarter of 1947.

*Riegel Paper Corporation*—Net income for 1947 was $1,140,329 as against $1,105,135 in 1946.

*River Raisin Paper Company*—Net profit for 1947 was $1,313,810 as compared with $647,698 in 1946.

*St. Regis Paper Company*—Net earnings for 1947 were $4,494,193 as against $3,698,826 in 1946.

*Soundview Pulp Company*—Net income for 1947 was $1,513,148 as against $1,414,073 in 1946.

*Sutherland Paper Company*—Net income for 1947 was $523,497 as compared with $610,695 in 1946.

*Taggart Corporation*—Net income for 1947 was $1,054,248 as compared with $792,694 in 1946.

*Union Bag & Paper Company*—Net income for three months ended March 31 was $3,560,000 as compared with $2,671,941 in the first quarter of 1946.

**New York Stock Exchange—Stocks**

| | Closing Prices April 24 | March 25 |
|---|---|---|
| A.P.W. Products | 5¼ | 5 |
| Celotex | 27¼ | 25½ |
| Same Preferred | 18⅝ | *19¼-19⅝ |
| Certain-teed Products | 17 | 15¼ |
| Champion P & F Co. | 23⅝ | 10 |
| Same Preferred | 96 | 93 |
| Container Corp. | 39½ | 39¼ |
| Same Preferred | *96-98 | *94¼-96¾ |
| Continental Diamond | 11½ | 10¾ |
| Crown Zellerbach | 30⅞ | 29¼ |
| Same Preferred | 98¼ | 97 |
| Same $4 Preferred | 113½ | 109¼ |
| Dixie Vortex | 37½ | 35 |
| Same "A" | 53 | *45½-50¾ |
| Robert Gair | 8⅝ | 8½ |
| Same Preferred | *19-20 | *18½-10 |
| International Paper | 56¾ | 48⅝ |
| Same Preferred | *96-98 | *92-93 |
| Kimberly-Clark | 22⅛ | 20¼ |
| Same Preferred | 102⅞ | *93-96 |
| McAndrews & Forbes | 38 | 36⅞ |
| Marathon | 20¾ | 21 |
| Masonite | 58½ | 52½ |
| Mead Corp. | 20⅛ | 18 |
| Same Preferred | 82 | 81 |
| Same 2nd Preferred | 41 | *39-40½ |
| National Container | 12¾ | 12⅜ |
| Paraffine Cos. | 26 | 23½ |
| Same Preferred | *103-105 | *101-103½ |
| Rayonier, Inc. | 28¾ | 26 |
| Same Preferred | 32¾ | 32⅝ |
| Scott Paper | 44½ | 41½ |
| Same Preferred | *91-92 | *91-91½ |
| St. Regis | 10¾ | 9⅞ |
| Same Preferred | 85 | 83½ |
| Sutherland Paper | 39½ | 38 |
| Union Bag & Paper | 33½ | 30⅜ |
| United Board & Carton | 13½ | *12¾-13½ |
| U. S. Gypsum | 100 | 98½ |
| Same Preferred | *175-177 | *174-175 |
| West Va. P & P | 46 | 40⅞ |
| Same Preferred | 105 | 103½ |

**New York Stock Exchange—Bonds**

| | | |
|---|---|---|
| Celotex 3½% | ..... | ..... |
| Champion P & F Co. 3% | ..... | 97¼ |
| Certain-teed 5½% | ..... | ..... |

**New York Curb Exchange—Stocks**

| | | |
|---|---|---|
| Am. Writing | 7½ | ..... |
| Great Northern | 41 | 38½ |
| Taggart | ..... | 10⅝ |

*Closing Bid and Asked Prices.

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## NAT'L CONTAINER CORP. CELEBRATES 10TH ANNIV. OF JACKSONVILLE MILL

The tenth anniversary of the establishment of the pulp and board division of the National Container Corporation at Jacksonville, Florida, was celebrated April 7 with a banquet in the George Washington Hotel.

The principal address was delivered by Harold Cole, executive vice president and general manager of the Florida State Chamber of Commerce. Samuel Kipnis, president of the National Container Corporation, served as toastmaster and guests included city officials, officers of the Jacksonville Chamber of Commerce, the State Chamber of Commerce, presidents of the various civic clubs, executives of the National

**Research**
The world's finest water treatment laboratories are at the disposal of Nalco customers for determination of the slime-forming organisms in their mills and the study of treatment effects.

**Chemicals**
Nalco provides the right chemical to control each type of organism. Nalco chemicals are stable, safe and easy to handle.

**Field Service**
Nalco field engineers make the initial survey of the mill and maintain a continuous follow-up of results.

**Proof of Performance**
Nalco paper mill clients testify to continuously successful slime control by their continued use of the Nalco System: 77.2% have employed Nalco over 5 years; 33% over 10 years; 59% of the over-10-year group have relied upon Nalco for more than 15 years.

## Rely on the *Nalco System*

The problem of slime accumulations in paper mills can now be effectively controlled with a minimum of expense and labor by following these proven steps:

1. Accurate identification of organisms to be controlled.
2. Correct choice of chemical treatment.
3. Determination of proper points of application and proper dosage.
4. Continuous supervision of treatment.
5. Good sanitation throughout the mill.

Nalco is prepared to assume the major part of this job by providing the chemicals, feeding equipment, laboratory studies, methods and constant check-ups that will assure you *permanent* slime control. It is the practical way to meet the problem . . . for complete details and literature write to Nalco.

**NATIONAL ALUMINATE CORPORATION**
**6232 West 66th Place, Chicago 38, Illinois**
*Canadian inquiries should be addressed to Alchem Limited, 555 Eastern Ave., Toronto 8, Ont*

*—A* Complete *Scientific Paper Mill Water Treating Service . . . Slime Control . . . Water Softening and Clarification . . . Controlled Alumina Sizing Method . . . Boiler Feedwater Treatment.*

*Nalco*

Container paper mill and box factory, and labor leaders.

Operation of the Jacksonville paper mill began on April 7, 1938, by the National Container Corporation and the box factory under the same roof was started a little later. At the start, the plant represented an investment of about four million dollars, with about five hundred employees, and an annual payroll in the one-million-dollar bracket. Now, after ten years' operation, the combined mill and factory employs more than one thousand persons, and the payroll reaches over two and one-half million dollars per year.

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▶▶▶ THE BRAND NAMES Foundation's "Certificate of Public Service" was presented at the Wisconsin awards dinner to seventy-eight brand names which have served the American consumer for fifty or more consecutive years. Among the brands were Evergreen toilet tissue, towels and napkins, made by Hoberg Paper Mills, Inc., Green Bay, Wisconsin, since 1898, and Milpaco paper products, introduced by the Milwaukee Lace Paper Company, Milwaukee, in 1898.

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## UNION BAG & PAPER CORP. SPONSORS SEED PLANTING

In keeping with its policy of growing trees for the future, the Union Bag and Paper Corporation of Savannah, Georgia, has sponsored the planting of approximately one million slash pine seedlings in its own forests and on a number of other privately owned tracts in Georgia during February and March.

The company plantings were made principally in the Ogeechee forest near Savannah and the Okefonokee forest near Folkston.

The approximately half million seedlings were distributed through 4-H Clubs and Future Farmers of America organizations in Georgia high schools. Mechanical tree planters were used for the first time on an extensive scale. These modern planters set from 7,000 to 12,000 trees a day at the rate of 725 trees to the acre.

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## INCORPORATION GRANTED MARITIME NEWSPRINT MILL

A bill to incorporate the Maritime Pulp and Paper Mills Corporation (Cf. P.I. and P.W., April, 1948, p. 44) has passed the New Brunswick Legislature, after receiving several amendments. It has been introuced before the Legislature's corporations committee by Hon. R. J. Gill, provincial minister of lands and mines. A total of $7,520 was paid in fees for the incorporation, making it the largest incorporation fee ever received by the province.

The main debate on the bill centered around the clause providing for tax concessions for the proposed company, on the basis of an agreement made between the company and the council of Charlotte County, where the new mill will be located.

This agreement provides (1) that all property of the company within the county of Charlotte shall be exempt from taxation until the completion of the project, (2) that the total valuation of the company for assessment purposes for the first 15 years after its completion shall be set at $500,000 and (3) that the valuation shall not extend to the employees' houses and timber lands owned by the company.

An amendment to the bill limits the company's rights for expropriation for hydroelectric development to the Lepreau and New Rivers, in Charlotte County. This amendment was added, after much discussion, to protect the interests of the St. George Pulp and Paper Company, whose supply of water is obtained from sources near those of the new mill.

The new plant is expected to be completed and in full operation by January 1, 1950, and will employ over 3,000 men and will produce 400,000 tons of paper annually.

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## FELLOWSHIP ON INSECT CONTROL ESTABLISHED BY NEPCO FOUNDATION

A $6,300 industrial fellowship for the study of insect control in stored pulpwood has been established at the University of Wisconsin by the Nepco Foundation, Port Edwards, Wisconsin, according to an announcement issued jointly by the Board of Regents of the University and the directors of the Nepco Foundation.

Results of the three-year research, which will run until March 31, 1951, will be made public by the University of Wisconsin through publication or any other manner best serving the public interest, according to the agreement covering the establishment of the fellowship.

The project has been assigned to the Department of Economic Entomology and the University of Wisconsin has designated Dr. R. D. Shenefelt to give it his personal supervision. In addition to studying insect control in stored pulpwood, the problem of prevention of damage to adjacent timber from beetles emerging from piles of stored pulpwood will also be explored.

The Nepco Foundation was established at Port Edwards, Wisconsin, last year as a nonprofit corporation for the promotion of religious, charitable, scientific or educational activities of the inhabitants of the state of Wisconsin (Cf. P.I. and P.W., Jan., 1948, p. 1410).

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## PUBLISHERS COMPANY BUYS HAWLEY PULP & PAPER CO.

Sale of the Hawley Pulp and Paper Company (Oregon City, Ore.) was completed recently at Portland, Oregon (Cf. P.I. and P.W. April, 1948). The new owner is the Publishers Paper Company, which includes officials of the *Los Angeles Times*, the *Deseret News* of Salt Lake City, the Oregon Pulp and Paper Company, and the Columbia River Paper Mills.

Directors are Jack Smith of Portland; James Miller of Blyth and Company, investment brokers; Norman Chandler of the *Los Angeles Times;* Richard G. Adams of the *Times;* Harry W. Bowers of the *Times;* Albert Bowen of the *Deseret News,* and H. M. Youel of the Oregon Pulp and Paper Company.

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## TECHNICAL MEN ORGANIZE NEW LITHOGRAPHIC GROUP

Action toward the formation of an organization for the technical men in the lithographic and allied industries was taken at a recent three-day technical forum of the LTF Research Committee in Chicago. Since this gathering of technologists was the first time that many of those eligible for membership had congregated, the advisability of forming such a group was suggested in one of the day sessions. It was then discussed further in a special night session attended by sixty-seven of those who were interested.

The aims and functions of the new organization were discussed at the night session at which Dr. Frederick H. Frost, research director of the S. D. Warren Company, acted as chairman. It was generally agreed that the organization could function most efficiently if it were autonomous and not affiliated with any other organization, with membership being based entirely on the qualifications of individual men.

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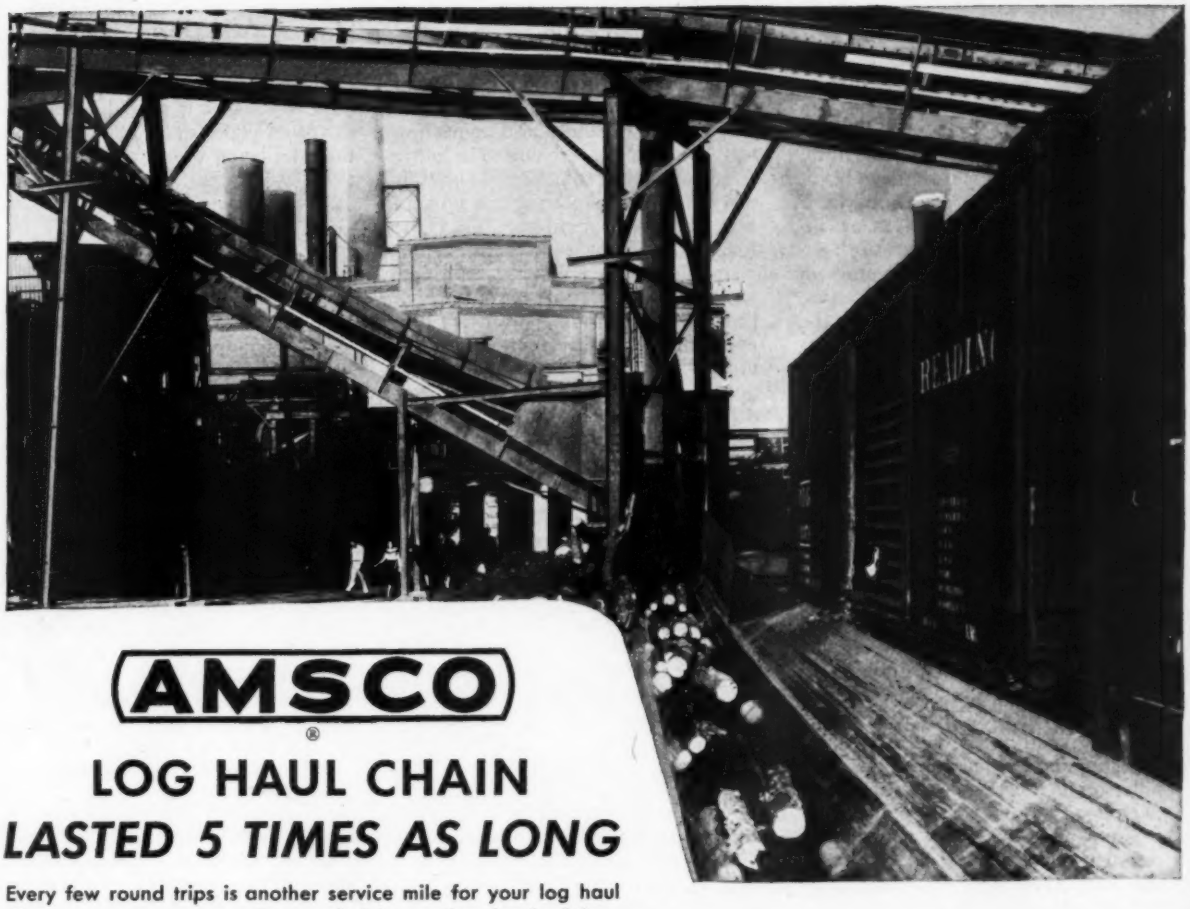
## EXTENSION OF RECIPROCAL TRADE IS UNDER DEBATE

A rash of debate has broken out in Washington over the Congressional Joint Resolution extending the present Reciprocal Trade Agreement Act. The Ways and Means Committee of the House of Representatives is disinclined to stage public hearings and inject the issue into the fall presidential campaign, while the State Department proponents of the program are demanding

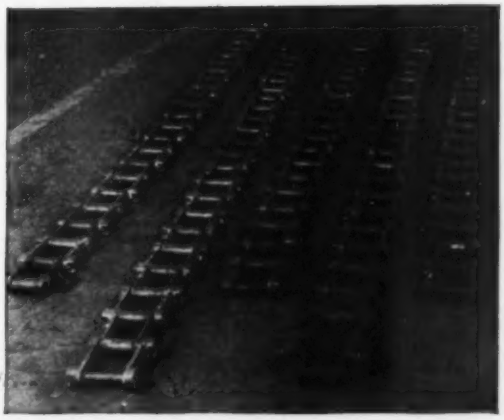



AMSCO®

# LOG HAUL CHAIN
## *LASTED 5 TIMES AS LONG*

Every few round trips is another service mile for your log haul chain . . . every extra mile traveled is another load of logs delivered to the plant. In the large Southern pulp mill shown here, Amsco multiplied these valuable "chain miles" by more than five times . . . delivered over five times the logs handled by previously-used chain.

The combination of salt water and abrasive silt in the pond formerly resulted in a chain life of 5 or 6 months. An Amsco manganese steel haul-up chain has been in service now for 27 months. Strands of this combination No. 132 chain are shown at right. K-2 attachments are provided every 12th link, or every 6 ft., to which channel or angle bars are riveted to act as log dogs.



Manganese steel — "the toughest steel known" — withstands shock stresses that fracture other metals. The surface work hardens and under impact and pressure develops a "plow-share" polish that resists abrasive and frictional wear. These properties (plus specially engineered design when required) give you a chain both trouble-free and economical. You can also cut maintenance, breakdown, and wear with Amsco conveyor, drag, transfer, and barking drum chains, sprocket wheels, solids pumps, log-slip liners and other punished parts. Tell us your problem.

AMERICAN Brake Shoe COMPANY

**AMERICAN MANGANESE STEEL DIVISION**
CHICAGO HEIGHTS, ILL.

Foundries at Chicago Heights, Ill., New Castle, Del., Denver, Colo., Oakland, Calif., Los Angeles, Calif., St. Louis, Mo.
Offices in principal cities. In Canada: Joliette Steel Limited, Joliette, Que.

open hearings and public debate in Congress.

Some sections of industry fear the effects of the agreements upon domestic industry, and it is no secret that the paper industry is opposed to the extension of the Act in its present form, which gives the Administration a blank check for the revision of existing tariff rates. On the other hand many industries interested in exports are anxious for the continuance of the program as a means of increasing foreign sales. The Administration position is that the trade agreement program for the reduction of trade barriers is a policy for the greatest good of the entire world.

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## NEKOOSA-EDWARDS CO.'S POWDERED FUEL BOILER NOW IN OPERATION

The final step in the three-way program of modernizing steam production at the Nekoosa, Wisconsin, mill of Nekoosa - Edwards Paper Company was recently completed with the installation of a new Combustion Engineering 125,000 pounds per hour capacity boiler. The boiler was started December 15, 1947, putting the entire Nekoosa mill steam production on modern, high pressure, high efficiency operation.

Designed to operate at 450 pounds pressure and 700 Fahr. temperature, the new boiler is equipped with two size 453 Raymond Bowl pulverizers, each of which will handle 75 per cent of full capacity. With two pulverizers, continuity of operation is more certain because most boiler plant trouble originates with moisture and foreign matter in the coal, or plugging of the mills. With the large mill capacity and with the minimized probability of both mills plugging simultaneously, there should be few service interruptions.

The first step in the Nekoosa steam production program was the installation of the Combustion Engineering high pressure recovery unit. The entire kraft recovery production is on this unit which has been in operation since May 22, 1942. On May 8, 1944, the second step in the modernization program, the 3,500 KW Elliott turbine, was placed in operation. All of the high pressure steam from the recovery unit passed through the turbine, representing 40 per cent of the mill load with 60 per cent remaining on the old low pressure boilers. This load is now being handled by the new boiler except for that handled by the wood refuse boiler which remains in operation.

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## IMPORT NOTES

Importers have filed 64 additional protests against the inclusion of the Canadian sales tax in the dutiable value of Canadian groundwood printing paper. Of these cases 18 involved shipments through Detroit, 34 through Sault Ste. Marie, and 12 through Port Huron.

Customs officials, according to Warren B. Bullock, manager of the Import Committee of the American Paper Industry, are already finding that the Geneva trade agreements have been so phrased as to throw doubt on the classification of many grades of paper. Reductions, apparently, were made without full appreciation of the effect that might result on papers which may be subject to different classifications. A typical instance is a shipment of cigarette tipping through a South Carolina port. The paper is in rolls the width of the tipping, and is coated with an imitation of cork. The paper is gummed, and the issue before the officials is whether it should be dutiable as coated paper or as gummed paper, the rates being widely different on the two classifications. Many other similar cases are arising.

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## ROBERT FOWLER STUDIES CANADIAN PAPER INDUSTRY

Robert M. Fowler, president of the Canadian Pulp and Paper Association, has been loaned to the Department of Reconstruction and Supply to make a special study of the paper industry in Canada, in relation to the United States dollar shortage. He will explore ways and means of increasing the flow of United States dollars into Canada from this industry.

Importance of the paper industry in terms of dollar flow, is shown in a DBS breakdown of 1947 export figures. Total value of pulp and paper exports to United States was $419,700,000, a record high, 25 per cent in value above $328,800,000 in 1946. Chief item was 73,500,000 cwt. of newsprint valued at $292,000,000 (66,500,000 cwt. valued at $225,000,000 in 1946).

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▶▶▶ A TWO-FOR-ONE SPLIT in the common shares of Puget Sound Pulp & Timber Company (Bellingham, Wash.) was authorized by the stockholders at their annual meeting in April. The certificate of incorporation was amended so as to authorize a total of 778,189 common shares, twice the number now outstanding. On July 15, 1948, new stock certificates for the additional shares will be mailed to stockholders of record July 1, 1948, representing the same number of shares as owned by them on the record date.

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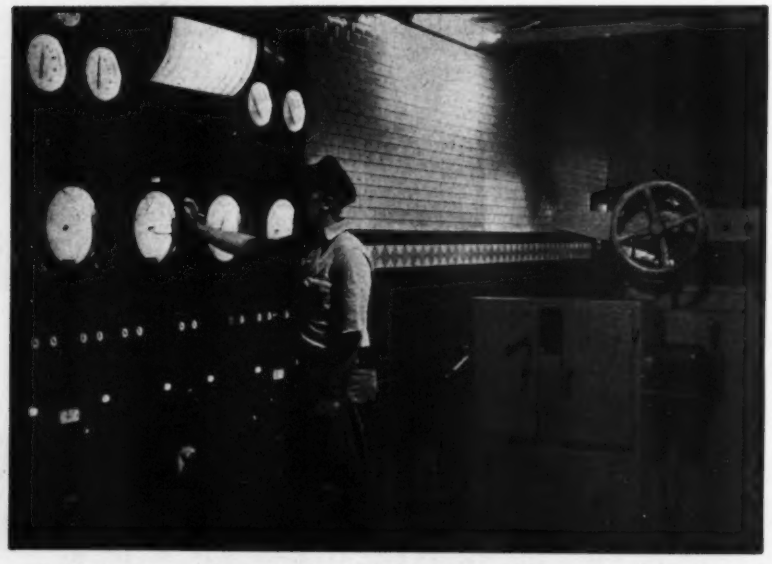
## CONSTRUCTION UNDER WAY AT COOSA RIVER PROJECT

Ground has been broken and construction is now under way at the $32,000,000 plant of the Coosa River Newsprint Company at Childersburg, Alabama (Cf. P.I. and P.W. October, 1947).

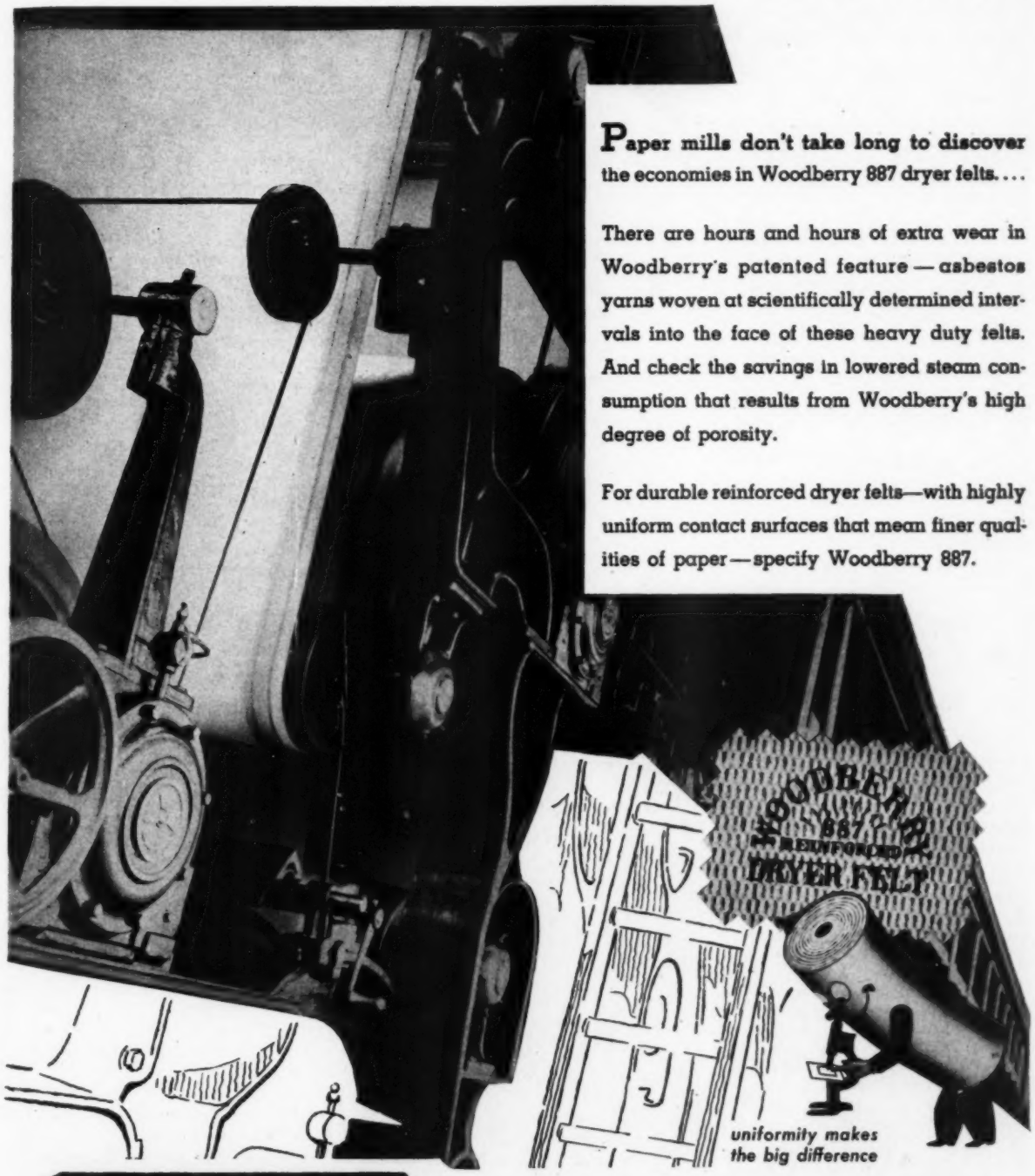
Annual output of the plant will be 100,000 tons of newsprint and 60,000 tons of sulphate pulp. The newsprint will be consumed mostly by southern newspapers, and the sulphate pulp will be used for wadding for Kleenex by the International Cellucotton Products Company.

Some 1,500 persons will be employed in the construction project during the next eighteen months and permanent personnel of the plant will



*Installation of new boiler completed at Port Edwards plant of Nekoosa-Edwards Paper Co.*

# *Savings Will Be Felt... when you use Woodberry 887 Dryer Felts*




**Paper mills don't take long to discover** the economies in Woodberry 887 dryer felts....

There are hours and hours of extra wear in Woodberry's patented feature — asbestos yarns woven at scientifically determined intervals into the face of these heavy duty felts. And check the savings in lowered steam consumption that results from Woodberry's high degree of porosity.

For durable reinforced dryer felts—with highly uniform contact surfaces that mean finer qualities of paper—specify Woodberry 887.

*uniformity makes the big difference*

**TURNER HALSEY**
COMPANY
*Selling Agents*
40 WORTH ST. • NEW YORK

***Mt. Vernon-Woodberry Mills***

*Branch Offices* CHICAGO • ATLANTA • BALTIMORE • BOSTON • LOS ANGELES • AKRON

average more than 700, according to Ernst Mahler, executive vice president of Kimberly-Clark Corporation (Neenah, Wis.), which has the contract to operate and manage the mill. Several thousand more jobs will be provided to the timber industry of Alabama and Georgia to supply the plant's requirements of 230,000 cords of wood a year.

Attending the ground breaking ceremonies were officials of the Coosa River Newsprint Company, the contractors who will build the plant, and members of the Talladega County War Reconversion Committee who backed the project from its inception.

▼

## ST. REGIS HONORS 25-YR. EMPLOYEES WITH SERVICE PINS AT COMPANY DINNER

Twenty-one employees of St. Regis Paper Company and Taggart Corporation mills in Northern New York were honored at a testimonial dinner at the St. Regis Inn, Deferiet, New York, for completion of twenty-five years of service.

Clifford C. Wenzel, personnel manager of the northern group of mills, presided and called the names of the employees who received the 25-year pins. Speakers included E. F. Marshall, general manager of the ground wood division of the northern group of St. Regis mills; William R. Adams, general manager of the kraft division of the Taggart Corporation; and Alex Smalley, labor advisor to President Roy K. Ferguson.

▼

▶▶▶ MEMBERS OF THE 4-H Clubs in Emmanuel County, Georgia, collected 1,000 bushels of longleaf pine cones during the winter months and sold them to the State Department of Forestry for $1,000, a recent issue of the Georgia Forestry Bulletin discloses. Seeds from the cones were extracted at the Forestry Department's plant in Baxley, and were planted in the spring at Herty Nursery in Albany.

▼

## MANISTIQUE PAPER CO. INSTALLS RETIREMENT PLAN

Manistique Pulp & Paper Company (Manistique, Mich.) has adopted the retirement plan of the Mead Corporation of which it is an affiliate.

The plan is retroactive to January 1, 1947, for all employees with five years or more of service as of December 29, 1946, and benefits all employees as they reach five years service with the company. Past service benefits will be provided at no cost to employees who accept it and participate in the future by setting aside 1½ per cent of their earnings.

The corporation's contribution each year will exceed the employee's financial participation. The Mead Corporation has paid more than $2,500,000 in the past for service benefits.

The plan provides employees an opportunity to accumulate additional retirement benefits through a profit-sharing arrangement, which is explained in detail in a booklet given to all eligible employees.

▼

## EXPLOSION DAMAGES MILL OF COLLINS MFG. COMPANY

Damage estimated at $100,000 resulted from a flash fire and explosion at the North Wilbraham (Mass.) mill of the Collins Manufacturing Company. A series of six explosions occurred when a drum of peroxide fell off a truck in a storage room. The flames broke into a beater-room below the storage room, and 50,000 pounds of finished paper stock were damaged by fire and fumes. Raw materials, ready stock in the beater-room, and machinery also suffered heavy damage.

The company brought petition in the Superior Court at Springfield for appointment of a receiver in order to prevent creditors from tying up its assets. Judge James C. Donnelly appointed E. H. Thompson as receiver and ordered him to provide $200,000 bond, which was furnished.

▼

▶▶▶ INSPECTION OF manufacturing operations at the Lakeview, Wisconsin, mill of the Kimberly-Clark Corporation was made recently by more than 100 members of the Wisconsin chapter of the Industrial Packaging Engineers' Association.

▼

▶▶▶ FOOD CONTAINERS, bottle carriers, and clothing boxes are being manufactured by the Standard Paper Box Corporation of Los Angeles which began operations at its Longview, Washington, plant on April 1. Former employees of the Associated Paper Box Corporation are being retained by the new owners. Raymond T. Miller, vice president of the firm, is manager of the Longview plant.

▼

▶▶▶ FIRST OPERATING PROFITS of Nepco Courts, the eight-unit apartment building in Port Edwards, Wisconsin, will go to the Nepco Lake Boys and Girls Club Lodge Association as an initial contribution toward 1948 operating expenditures, Nekoosa-Edwards Paper Company has announced. The lodge gives the children of Port Edwards and Nekoosa the advantages of organized summer camping.


A TOUGH RUGGED OASIS for MILLS, FOUNDRIES, Etc.

For trouble-free service where there is excessive heat, dust, lint, acid fumes or high humidity

Here's a highly efficient OASIS Electric Water Cooler that's sealed against dust-laden, lint-filled air . . . heavily insulated against external heat . . . unaffected by high humidity . . . impervious to acid fumes. It features a water-cooled condenser in an airtight cabinet! There's durability in its stainless steel top and heavy-gauge, rustproofed cabinet. Available with EBCO's smooth-working dial-action bubbler or handy glass filler —or both. Write for details on OASIS Model OP-10-W. *The EBCO Manufacturing Co., 401 West Town St., Columbus 8, Ohio.*

OASIS ELECTRIC WATER COOLERS

Made by the World's Largest Maker of ELECTRIC DRINKING WATER COOLERS

# WARNING

in

size

the trend

is to

economy

Every step along the way, Hercules' papermaking chemicals are planned to give maximum economy to paper and board mills, no matter what their requirements may be. This trend extends even to packaging. Hercules Rosin Size, for example, is obtainable in drums, bags, or tank cars, and in paste or dry forms. An increasing number of paper mills are switching from paste size in drums to Dry Rosin Size in bags, because of the convenience in handling. Others, because of their particular needs, prefer Hercules Paste Rosin Size in tank cars.

HERCULES

SIZING MATERIALS AND CHEMICALS FOR PAPER

HERCULES POWDER COMPANY

961 King Street, Wilmington 99, Delaware

## WORK BEGINS ON ADDITION TO KIEFFER PAPER PLANT

Ground was broken recently for a 10,000 square foot extension to the present plant of the Kieffer Paper Mills, Ewing, Indiana.

The contract has been let for the structural steel, as this extension is to conform to the present plant which is of concrete foundation, monitor type building, brick walls, concrete floors and steel structure.

The building is to be used for storage and fabricating of various products manufactured by the Kieffer Paper Mills and will probably be leased to the Shoksorb Paper Products Company which fabricates many of the products of the Kieffer Paper Mills as well as handling certain surplus paper of other mills' manufacture.

The company has a fair backlog of orders and is operating six days per week. A steady demand for its various products is anticipated as long as business conditions are at today's level.

▼

▶▶▶ ANNUAL REPORTS for 1947 of more than 2,600 corporations have been entered in the Eighth Annual Report Survey being conducted by *Financial World,* and it is expected that 4,000 reports will be considered before the yearly contest closes on June 25. Reports receiving Merit Awards and thus eligible for the final judging for Oscar of Industry trophies will be announced in the July 4 issue.

▼

▶▶▶ APPLICATION FOR a building permit covering construction of a pulp warehouse at Niagara Falls, New York, which will cost an estimated $100,000 has been filed in the office of Building Commissioner Norman G. Ray by the International Paper Company. The warehouse is part of the company's system-wide expansion program. Pulp formerly was stored in the open by the company.

▼

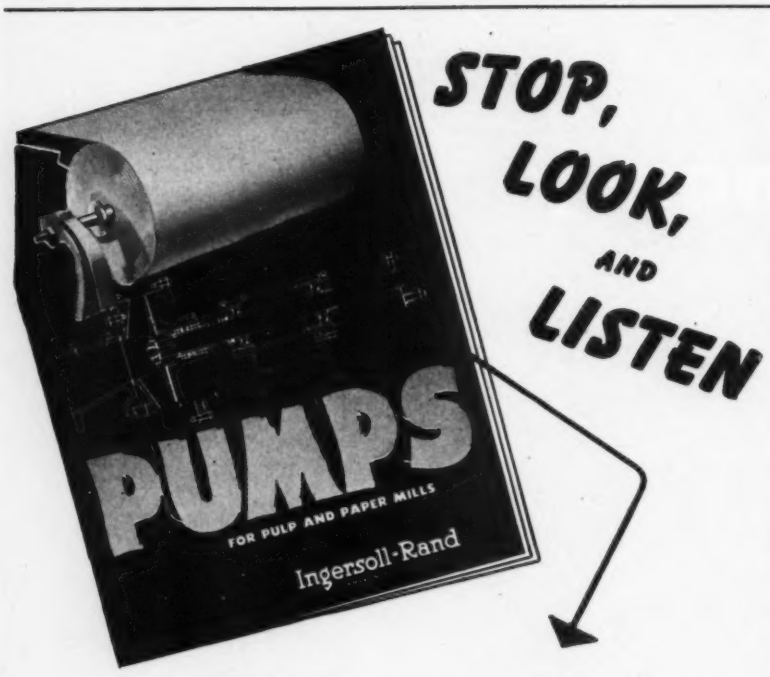
## BRITISH PAPER NOTES
### (March, 1948)

The Paper Trade of Great Britain continues to struggle in its efforts to recuperate from the effects of the war. Meanwhile it is severely handicapped by shortages of materials and the restraining hand of Control. The latter, while considered necessary in the prevailing conditions, could even now be considerably lightened and thus let the Trade go ahead by means of its own energies.

At such a time it is particularly unfortunate for the Trade to read that one of its best customers is rapidly becoming practically self-supporting.

A recent report from Australia shows that the production of pulp has increased from about 6,000 tons in 1938-9 to 83,000 tons in 1945-6 while consumption has advanced only from 42,500 tons in 1938-9 to 120,000 tons in 1945-6. Thus while consumption has risen by 300 per cent, production has progressed by 14 times. At this rate a few more years should see production overtaking consumption with a prospect of a small amount of export. When the present position in Australia is compared with paper exports from Great Britain to that country, the unfortunate picture is completed. In 1938 these exports totalled 63,876 tons and in 1947 only 17,001 tons. Admittedly, Great Britain was not in the position to offer Australia paper and board in 1947 at the 1938 rate, but the present indications are that when the time arrives for Great Britain to be in such a position, the Australian market will no longer exist. No doubt there will always be certain grades which will sell in Australia, but as far as bread and butter lines are concerned the market will be closed.

Meanwhile once again we are hearing that greater efforts are to be made to increase the rate of waste paper col-


**STOP** searching for the pump to fit your paper mill jobs.

Write to Ingersoll-Rand for bulletin number 7022 and **LOOK** over the many pulp and paper mill units that it covers. Of the possibly twenty or more types of pumping jobs necessary in a pulp and paper mill, Ingersoll-Rand produces a reliable and efficient pump for each one.

Call an Ingersoll-Rand pump engineer as you will wish to **LISTEN** to what he can tell you. He knows the answers and can aid you.

Ingersoll-Rand Company, Cameron Pump Division, 11 Broadway, New York 4, N. Y.

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102-10

lection. To bring this about the Waste Paper Recovery Association have announced a £7,500 contest. This incentive will be directed at the Local Councils who during the three months, March to May, show the greatest percentage of increase over last year. England, Wales and Northern Ireland have been divided into three sections (Borough Councils, Urban Councils and Rural Councils) and Scotland is being treated separately. The aim is to produce 100,000 extra tons of waste before July. Recent returns disclose that during 1947 local authorities collected 226,776 tons making 2¼ million tons since November, 1939.

As the critical material position persists, so thoughts turn to straw pulp. The chairman of the Olives Paper Mills referred to this shortage caused, among other things, by the recent drought in Scandinavia but more particularly by "the disproportionate share of world output absorbed by the U.S.A. market" and "the insatiable capacity of the American consumer market" together with Home dollar shortage and the natural preference of European producers to sell for dollars. He expressed the opinion that as "the curtailment of capital expenditure is generally accepted as a necessary part of current economy it is impossible for the paper industry to go forward with any large scheme for the utilization of straw. It is my view that the future of the pulp supply position is so serious . . . that H. M. Government should give urgent consideration to the desirability of large scale installation of straw pulp plants."

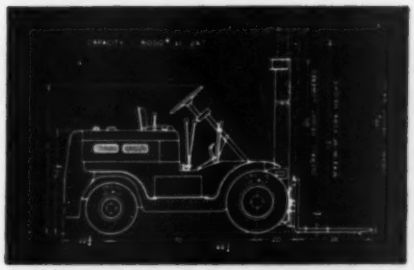
The whole subject of material purchases abroad had recently been raised in the House where one member pointed out that recently the Board of Trade had instructed the Control to purchase waste paper in Sweden at £24-15-0 per ton which when cleared of its rubbish the actual cost was probably higher than the purchase of pure pulp. The Newsprint Supply Company had just been authorized to purchase 20,000 tons of newsprint in Sweden. Yet if pulp had been purchased in its place there would have been a saving of £15 per ton. It was pointed out that the price the Board of Trade was willing to pay for pulp was below the world price, consequently it did not call forth the required amount.

Concurrently with this it was announced that Finland had agreed to supply 190,000 tons of chemical wood pulp, 30-40,000 tons of mechanical pulp together with a supply of other wood items and that the recent tentative order for 10,000 of newsprint to be delivered during the second half of 1948 had received Government authorization.


MATERIAL HANDLING *News*

*Here's* **BIG NEWS!**

**CLARK PRESENTS . . . . . YARDLIFT "60"**



**a pneumatic-tired fork truck of 6000 pounds lift capacity, for the BIG jobs of handling the BIG, heavier loads under toughest, roughest conditions —a machine whose BIG-ness is matched by its BIG potential usefulness to Industry.**

Does material handling in your business involve carrying heavy loads over rough, uneven, slippery surfaces, indoors or out?

**HEAVYWEIGHT CHAMPION**

Here's the answer—Clark's YARDLIFT "60," for handling 6000-pound loads on pneumatic tires. This heavy duty machine completes Clark's pneumatic tired "team," developed during 1947—with the YARDLIFT "40" and the YARDLIFT "20," of 4000-lb. and 2000-lb. capacities respectively. Rugged, nimble, steady, these machines revolutionized and simplified many difficult handling operations, with sharp reductions of accidents.

**DESIGNED FOR SAFETY**

The YARDLIFT "60" has all the sound and practical features so conclusively proved by the performance of the YARDLIFT "40" and the YARDLIFT "20." Safety is of utmost importance in this field of handling; and the machine's two-wheel steering axle and dual-wheel drive axle with wheels widely spaced, provides maximum security. The pivoted steering axle mounting, a Clark development, enables the machine to carry its load evenly and safely while the tires follow smoothly the ups and downs of the ground surface. A special steering-gear ratio makes for easier operation; and the driver has a comfortable air-cushioned seat, easily adjustable and placed for good visibility.

That your business may enjoy these advantages, talk things over with a Clark field engineer, a man trained to survey your operations and to make unbiased recommendations as to the equipment that will serve you most economically. CONSULT CLARK.

**CLARK** ELECTRIC AND GAS POWERED **FORK TRUCKS**
AND INDUSTRIAL TOWING TRACTORS

CLARK EQUIPMENT COMPANY, TRUCTRACTOR DIVISION, BATTLE CREEK 22, MICH.
REPRESENTATIVES IN PRINCIPAL CITIES THROUGHOUT THE WORLD

Another important section of the Trade, that of the Association of Makers of Coated Papers, has recently made an appeal to the Government in respect to Trade Agreements. L. C. S. Lewsey, the chairman, appealed to Sir Stafford Cripps and Harold Wilson "for consideration of our interests before trade agreements, which include paper products, are completed with other countries." The chairman knew that it would be impossible "to consult industry generally in such matters; on the other hand it would not be unreasonable to ask the Board of Trade to ascertain whether agreements exist between such sections as ours and countries with which general agreements are contemplated."

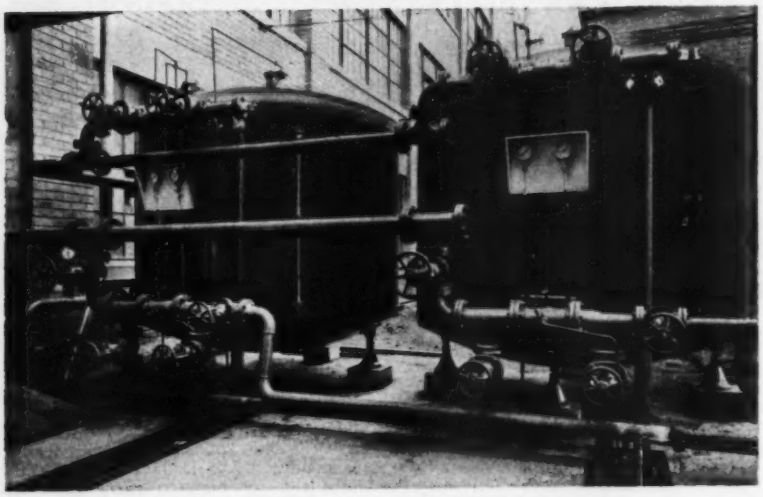
It will be recalled that this Association has just ratified an agreement with the Belgium makers of coated papers. This agreement was in respect to white and tinted enamels, and signatures to the agreement included the coated paper makers, the paper merchants and the British Baper Box Federation, thus covering the makers, supplies and consumers.

The coated paper section of the British paper trade is showing extraordinary vitality in respect to exports. Despite the many present difficulties these exports, which in 1938 totalled only 10,077 tons, reached 12,758 tons in 1946 and 16,697 tons during 1947 and both these latter figures were reached during a period when the Trade as a whole were only producing at about 70 per cent of prewar. In an effort to still further increase the sales of these papers the makers of coated papers are arranging for a display of their papers at the forthcoming British Industries Fair to be held in May.

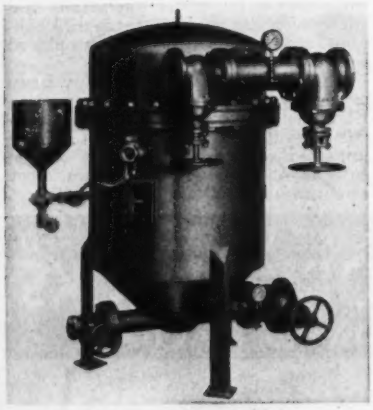
The chairman of the Export Group of this Coated Association, Alastair H. Bruce, has recently been elected president of the Paper Makers' Association for 1948, a position he held during the war years. The P.M.A. in its year's report showed that the total of materials received during 1947 was 1,064,808 tons against 950,141 in the previous year and nearly two million tons in 1938. Although wood pulp imports had been lower in 1947 than in 1946, this loss had been more than compensated by the receipts of esparto grass although, of course, the grass does not offer such a high yield of fiber. Consumption of materials, comparing 1947 with 1946, showed a decline in pulp wood of approximately 23,000 tons, of wood pulp of 72,000 tons and straw of 106,000 tons. Esparto grass and rag consumption was higher, as also was waste paper. Total production of all papers and boards during 1947 was 1,735,940 tons, actually 40 tons higher than the previous year. A very creditable performance in view of the fact that the coal crisis happened in 1947. Imports had risen from 30 per cent of prewar to 46 per cent between 1946-7 and exports at 60 per cent had practically maintained the previous year's figure.

Closely associated with the P.M.A. and the Coated Paper Makers is the china clay industry of Cornwall and Devon on which a Government Working Party has just made a report. Existing records show that the industry is nearly two centuries old but that for the first century progress was extremely slow and in 1856 production was 65,600 tons. By 1874 this had jumped to nearly 200,000 tons and by the beginning of the present century to over half a million tons. Just prior to World War I annual production reached 835,480 tons and it is considered that even if production touches one million tons there are sufficient reserves to last another century. Production per man in 1927 was 199 tons and by 1937, 236 tons, due to concentration on production of fewer and larger units and an increase in mechanization.


INFILCO Cooking Liquor Filters Assure Clean Liquor to Digesters



Pressure Filters for Kraft or Soda



Stellar* Filter for Sulphite

IMPROVE:
Brightness, Strength and Bleaching Quality

REDUCE:
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*Trade-mark Reg. U. S. Pat. Off.

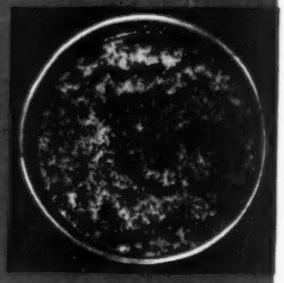
VIOLATION

# It's your decision...

← stop

or

go →



**DOWICIDES make the difference!**

**Stop paper losses due to mold—use the Dowicides!**

Corrugated cartons and other paper products often deteriorate when stored under conditions of high humidity in damp warehouses. This condition is usually accompanied by unsightly discoloration of the package and offensive odor. Many processors have successfully used a Dowicide treatment to make containers for industrial products mold resistant.

This is only one of the many uses of the Dowicides in the pulp and paper industry. For further information on the application of these versatile fungicides and bactericides, contact your nearest Dow office.

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# DOWICIDES

germicides and fungicides


## CHEMICAL COMMENTS

### NEW AROMATIC SPECIALTY FOR PERFUMES, SOAP, COSMETICS

C•64 is a new Dow Aromatic Specialty. It possesses richness and warmth, freshness and sparkle—making it adaptable to both modern and oriental type perfumes. Its odor is powerful and spicy, with a slightly minty touch. A highly stable, crystalline material, C•64 blends well with citrus oils and dissolves even in dilute alcohol. It will not discolor milled soap or cosmetic preparations and is therefore a valuable ingredient in the manufacture of those products.

### PROPYLENE GLYCOL USED AS SHORTENING EXTENDER

The food industry is making increasing use of low-cost Dow propylene glycol because of its unusual properties as a solvent, humectant, preservative, and wetting agent. Through the wetting action of this highly purified material it has been found possible to extend the effectiveness of shortening in producing baked goods. Propylene Glycol aids in the dispersion of the shortening throughout the batch with a consequent saving of critical shortening not otherwise possible.

### AN EFFECTIVE THICKENER FOR IMPROVED DYE PRINTING

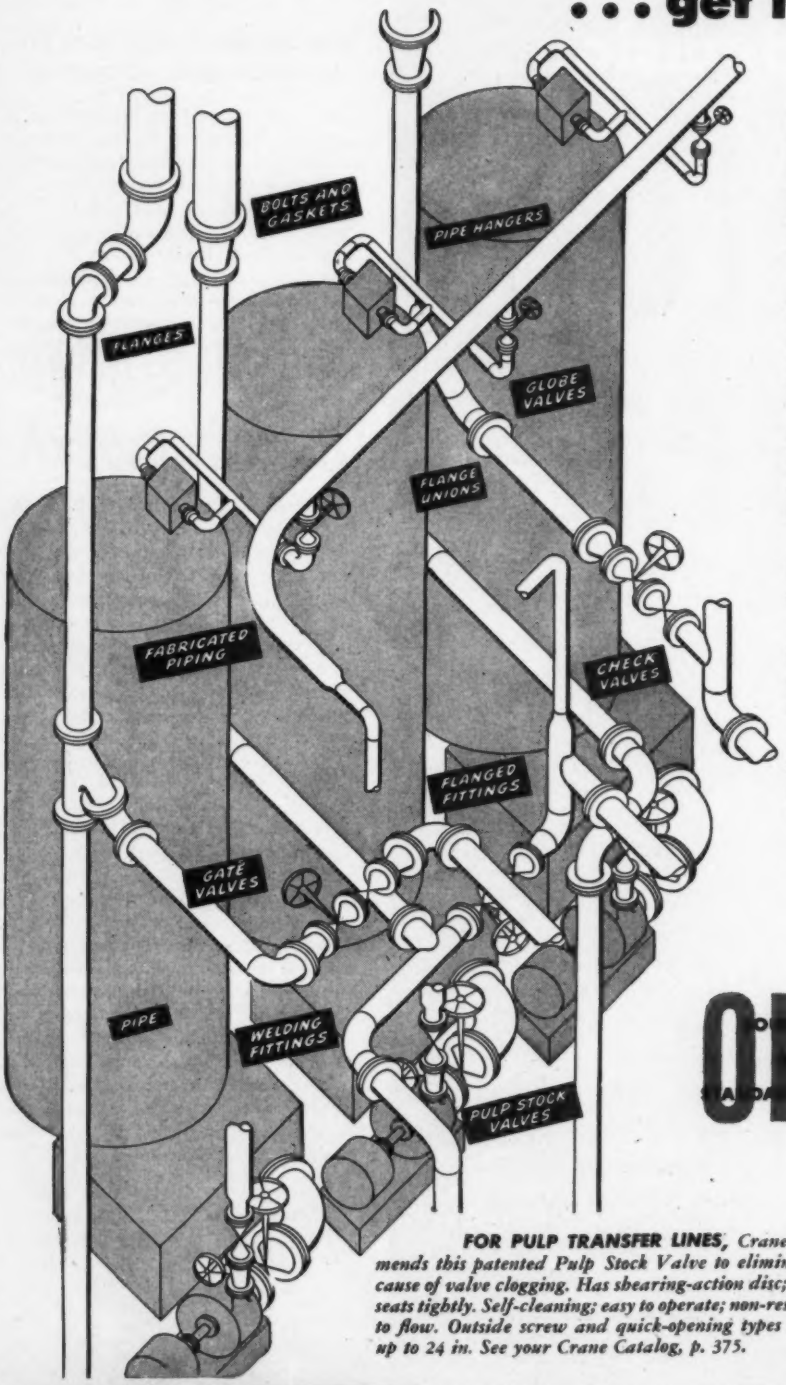
Methocel, Dow cellulose derivative, has demonstrated unusual possibilities as a dispersing, thickening, and binding agent. One of its important applications is in textile printing. As a thickener for fast color salts and diazotized bases for printing on naphthol prepared grounds, it yields prints of exceptional brightness, smoothness, and sharpness of mark with greater penetration and efficiency of dyestuff. Methocel can be used in dyes either for machine or screen printing.

*Additional information about any of these products is available on request.*


DOW

CHEMICALS INDISPENSABLE
TO INDUSTRY AND AGRICULTURE

# For widest choice of piping equipment ... get it from CRANE!




**Take a bleach plant,** or beater room, or boiler house for example. All the piping equipment for these or any paper mill installation can be had from Crane: valves, fittings, pipe line accessories, and pipe—in brass, iron, steel, or alloys.

Complete selection is but one reason why so many mills standardize on the Crane line. It's just one feature of the 3-way advantage of getting everything in piping from Crane.

**ONE SOURCE OF SUPPLY** helps to simplify all piping procedures—from specifying and ordering, to erection and maintenance. One catalog and one order cover everything for the job.

**ONE RESPONSIBILITY** for materials helps to get the best installation and to avoid needless delays.

**OUTSTANDING QUALITY** in every item from Crane means uniform efficiency and dependability in every part of piping systems.

Your local Crane Branch or Wholesaler is amply stocked to give you these piping advantages today.

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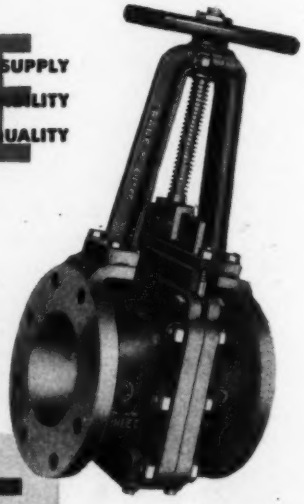
*Serving All Industrial Areas*

ONE
SOURCE OF SUPPLY
RESPONSIBILITY
STANDARD OF QUALITY



**FOR PULP TRANSFER LINES,** *Crane recommends this patented Pulp Stock Valve to eliminate the cause of valve clogging. Has shearing-action disc; always seats tightly. Self-cleaning; easy to operate; non-restricting to flow. Outside screw and quick-opening types in sizes up to 24 in. See your Crane Catalog, p. 375.*

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VALVES • FITTINGS
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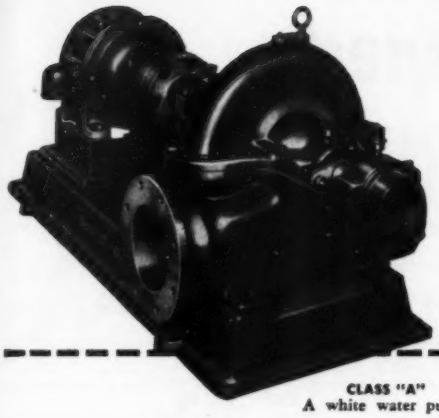
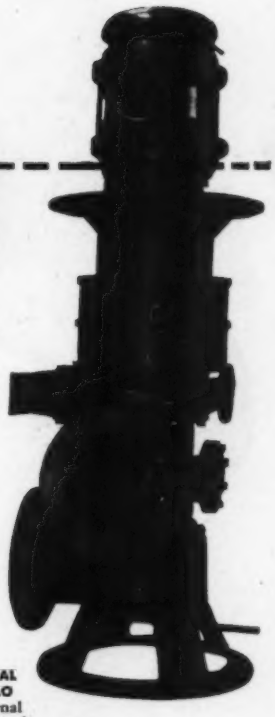
FOR EVERY PIPING SYSTEM



CLASS "A"
A white water pump

CLASS "DV"
Vertical High-Density
Stock Pump



VERTICAL
AGI-FLO
or external
agitator and
pump

# PUMPS

## BY SHARTLE

Most diversified line of pumps engineered for stock and white water pumping on the market; also for external chest agitation, pumping.

Literally hundreds of impeller designs, there being some 250 different impellers for the Shartle-Miami HMS high-density pump alone.

There is more to pumping than just hooking up any old pump. Stock and white water pumps, to do good work, should be engineered for the job and that engineering should be based on mill experience.

*If it's pumping and agitation, take it up with Shartle.*

**SHARTLE BROS. MACHINE COMPANY**
MIDDLETOWN, OHIO

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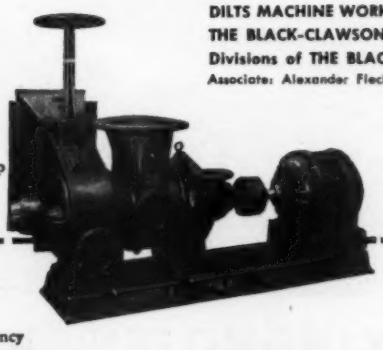
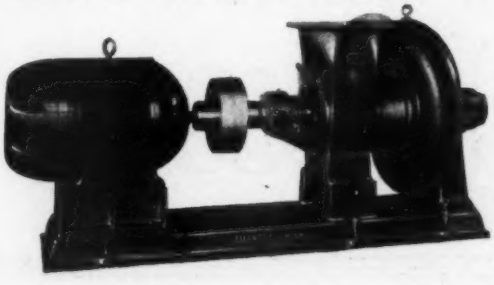
DILTS MACHINE WORKS, FULTON, NEW YORK
THE BLACK-CLAWSON CO. (ENGLAND) LTD., MORDEN, ENGLAND
Divisions of THE BLACK-CLAWSON CO., HAMILTON, OHIO
Associate: Alexander Fleck Limited, Ottawa, Canada



STANDARD AGI-FLO or external agitator and pump

CLASS "DS"—to handle slush stock at high consistency



CLASS "HMS"—for very high density

# "Something has happened ...to MACHINE No. 3"

**"Look at the extra tonnage!** Same old machine, same crew, same furnish and same fine formation! But so much more of it!"

**Sure, there is more of it.** Since the superintendent replaced the wet felts with Hamiltons more water is squeezed out at the couch; less time is needed to complete the job at the driers—less coal is burned under the boilers—not so many ends to the rolls.

**The same things** will "happen" in your mill when you equip your machine with properly selected Hamilton Felts.

• From the thinnest tissue to the heaviest board, there *IS* a Hamilton Felt that will do *your* work better, faster and at lower cost.

**SHULER & BENNINGHOFEN, HAMILTON, OHIO**

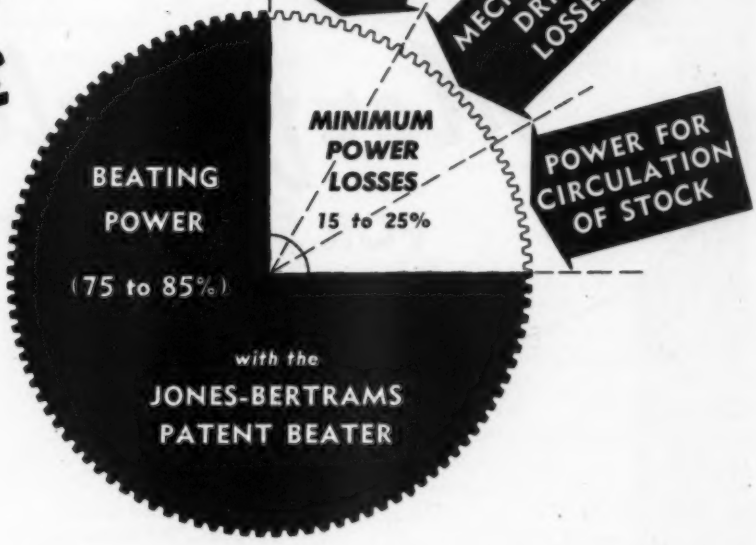
• Miami Woolen Mills •

**Hamilton Felts**

• Established 1858 •

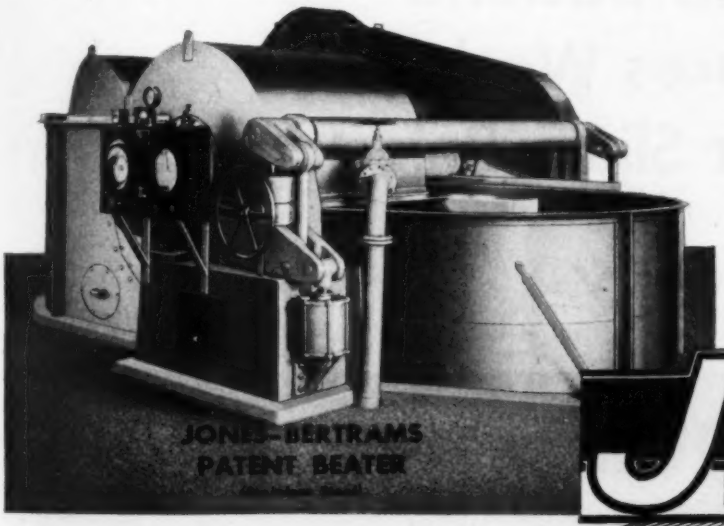
# "Beating Power"

## is work done on fibre treatment with the




# JONES-BERTRAMS PATENT BEATER

The JONES-BERTRAMS PATENT BEATER converts 75 to 85 percent of its power into actual work done on fibre treatment. Compare this efficient power utilization with your own equipment.




JONES - BERTRAMS PATENT BEATERS have been installed in scores of mills, replacing conventional beaters and other fibre preparation machines which wasted up to 70 percent of horsepower.

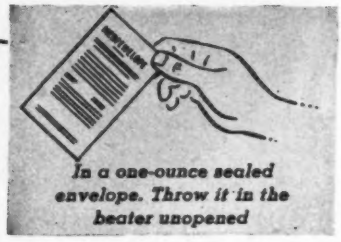
**Jones**

E. D. JONES & SONS COMPANY-PITTSFIELD, MASS.
Builders of Quality Machinery for Paper Mills

MANUFACTURERS AND DISTRIBUTORS IN CANADA: WATEROUS LTD., BRANTFORD, ONT.

# *Merfenelopes*

## FOR SLIME CONTROL



*In a one-ounce sealed envelope. Throw it in the beater unopened*

**Cleans Pipes**
**Kills Bacteria**
**Reduces Washups**
**Fewer Slime Rejects**

**R. T. VANDERBILT CO., INC.**
*230 Park Avenue, New York City*

## Paper Products in Preferred Demand

▶▶▶ THE PROBABLE COURSE that business and industry would take, as predicted by the economic forecasters at Washington since 1945, has been 100 per cent wrong. For three years now, these prophets of depressions have cautioned business men that "this year the revision would set in;" that "the first six months of this year would witness the start of the recession and the last six months would find us in the throes of depression."

During this time, we have seen business men actually making adjustments, reducing inventories, endeavoring to cut costs and get their commercial crafts in shape to weather the oncoming storm of adversity.

But, each year since 1945 has seen business rise to higher volumes and incomes mount to bigger totals. . . . The predicted storms were phony.

This year of 1948 was no exception to its predecessors. In December, 1947, the harbingers of "woe for business in 1948" loosed their blasts. The very magnitude of 1947 business was cited as an indictment against further expansion and progress as though there were something criminally wrong in the bigness of big business.

Of course, we have never had so great a volume of mercantile transactions. Never before have we had such an overwhelming number of our people gainfully employed. Never before in the history of America has industry maintained such a close relationship to capacity turn-out of goods of every description.

"It can't be maintained," the recessionists howled. "It must recede—1948 is the year of decision." Every effort was made to throw scares into the merchants of a collapse of prices, and by the same tactics spread the fear of depression among buyers, both commercial and consumers.

Take a look at the net of all the cries of "wolf! wolf!" We have finished the first quarter of the year and the first month of the second quarter with business volume suffering no appreciable contraction and every evidence on every hand that 1948 will be as great—or greater in volume as 1947. The biggest year in the record.

That goes for the paper industry, also, the essential business of this country. We have gone into the second quarter of this year with mills running to full capacity. The only limit to another year of expanded volume of paper is the limits upon capacity and raw materials. The years 1946 and 1947 witnessed handsome gains in volume of supplies, all of which have been absorbed and yet the pipe lines of quality products are bare. The Ersatz papers are being worked off, but it is exceedingly difficult to replace them with grades based upon virgin pulp content.

The increased demand for paper products is continuing because of the increase of consumers furnished by the amazing increase in population. Consumers were consuming last year, 340 pounds of paper for every man, women and child, a rise in consumption to a pound of paper per day for everyone of the 145,350,000 inhabitants of this country.

The increase in population is expanding. By 1950, the indication trend is for 151,000,000 census, consuming 375 pounds per capita, IF the 28,000,000 tons or more of paper can be supplied. The supply is in doubt, the demand is assured—therefore, the fear of a recession in the demand for greater volume of paper products is a myth. A present stock of paper products is a preferred asset to every possessor.

## More Trees Will Be Planted This Year

▶▶▶ THE ADVENT OF SPRING ushers in the planting season. And the planting of trees seems to increase with each return of spring.

Tree-planting on farms, state and national forests, and other public and private forest land is expected to set a new record this year, the Forest Service in the U. S. Department of Agriculture has announced. The estimate is made in connection with Arbor Day, traditional tree-planting day which in most states is observed in April.

The expected new record on tree plantings is based on estimates made to the Forest Service from state foresters, and upon scheduled plans of the Forest Service for plantings in national forests. Estimates from 43 states show 1948 planting goals of approximately 220 million seedlings as compared with approximately 91 million seedlings last year.

Since it takes about 1,000 seedlings to plant an acre, realization of state goals, along with national forest plantings, could result in a total of approximately 265,000 acres planted. The previous record was made last year when about 120,000 acres were planted.

Federal foresters said, however, that while an unprecedented interest in tree planting is evident throughout the country and the current increase in planting is encouraging, the amount of planting being done is only a drop in the bucket in comparison with the national reforestation job that needs to be done.

In recent years, several private lumber and pulp and paper companies have established nurseries for planting operations on their own lands, particularly in the Northwest and the South.

For the nation as a whole little more than 6,000,000 acres actually have been planted as against about 75,000,000 denuded and poorly stocked forest acres, most of which must be planted if they are not to remain idle and unproductive. Foresters estimate that at the present reforestation rate it will require several hundred years for this job.

The 152 national forests have about 1,200,000 planted acres in hundreds of plantations, but also have about 3,000,000 acres that require planting. Last year, public funds made available for national forest reforestation were sufficient to permit the planting of 31,000 acres, while this year's program calls for planting 45,000.

The planting of more trees on farms has been stimulated in recent years through the soil conservation districts. Trees for erosion control and proper land use of certain farm areas is a conventional part of the district conservation farm plans. The Soil Conservation Service in 1948 expects to produce approximately 35,000,000 trees in its nurseries for supplying soil conservation districts for demonstrational, or incentive, plantings; but the districts obtain their additional regular planting stocks from commercial sources or through the Clarke-McNary nurseries.

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Frank died in 1915.
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ames wore out six horses
attempt to re-

honor of being named as the geographical center of the world.

The U. S. Coast and Geodetic Survey says that a vast project to measure the size and shape of the earth will start from the small marker on the Meade ranch near Osborne.

[illegible] of the earth's 57,500,000 [illegible] between [illegible] and [illegible] of [illegible] this marker, which is the geodetic center of North America.

For years the marker has been the starting point of all surveys in the nation.

From the White House to the most unpretentious barn, all build-

## BETWEEN THE LINES

existing situation in regard to automobile headlights as a "serious factor against safety, courtesy and law."

The survey showed that about a third of drivers at night either forget or refuse to dim their headlights for approaching cars.

[illegible] inadequate, has not nearly kept pace in safety and efficiency with other automotive improvements.

2. Too many drivers are lax in dimming their lights.

3. Hazards of night driving are greatly increased by the large

George L. Schubert, re
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# We Were Dissatisfied with *the "Old Days"*

▶▶▶ TRY TO IMAGINE astronomers on Mars focusing their powerful telescopes on this, our earth. If you can stretch it a bit further, you may get around to thinking that we, the people, look to the Martians something like grains of radioactive sand, swirling in rivulets and waves or jerking crazily here and there over the surface of the globe.

Yes, everything on this planet is geared to high speed. . . . still higher speed. And sometimes when the going gets what we call "rugged," there comes a nostalgia for the "good old days," and we try desperately to look back from where we are going to where we used to be.

Ever a good soldier, man is trying very conscientiously to keep up with a world that reflects his own ingenuity. He wasn't satisfied with what he had and he lost his inheritance, simplicity, when he exchanged a serene way of life for a block of stock in Dissatisfaction, Incorporated.

▶▶▶ YOUR RADIO is now out-dated by video. If you like to see what you hear, you are figuring how long it will be before television sets come within your price range. And listen to this: The president and chairman of the Radio Corporation of America has told stockholders that nuclear energy, as a source of power, may become an important factor in communications. "It is no idle dream," he said, "to envisage that radio sets of the future may take their power from tiny capsules of atomic energy or even from small particles of such material. Should this miniature power supply become possible, smaller and more compact radio and television sets may be built." He said that more than 300,000 television sets are now in use, and an estimated 800,000 will be in homes of the public by the end of the yeear.

▶▶▶ IN THOSE "good old days," fingerprinting was not widely used, but nowadays the laying on of hands may convict you of a crime. Sometime about the 1980's maybe scientists will develop an apparatus so highly sensitive that it can record your breath wave-length. Wouldn't that smoke out people who invade forbidden places! Oh yes, did you know that electron tracks have been recorded, and quite successfully, too? Electrons, you know, are the small negatively charged particles that make up atoms. Eastman Kodak claims its scientists have done this by using a new electron-sensitive emulsion. The range of the electron tracks appears to agree with the theoretical range predictions made by nuclear physicists. It is claimed that the University of Montreal reported some such findings in 1946. But the Kodak tracks, first obtained at the company's research laboratory at Harrow, England, and later in Rochester, are long enough to remove all doubt as to their identity.

▶▶▶ OH, CURIOSITY! Man may re-enact that fable of the cat who got too much of it, and, atomically speaking, his civilization may meet the same fate as did the cat. But since exploration always has been the main zest of living, man will go on being very curious. Remember when you were a child and used to chase fire flies? It seems that some little boys who grew up to be chemists are being led by a natural curiosity to find out what makes the fire fly "flicker." And what do you think? Curiosity is working for business, too, because these chemists also want to know "how can we use the fire fly's light source?" The American Cyanamid Company states in its *For Instance,* that "ordinary light is associated with the production of heat and is inefficient in proportion to the amount of heat produced. In contrast, the fire fly's light is apparently a "cold light," therefore, the process should be highly efficient.

The outline of *Chemiluminescence* goes on to state:

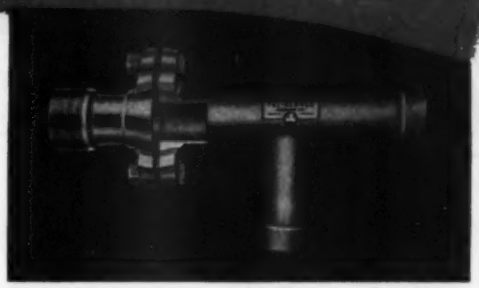
"The fire fly can vary the intensity of its light within narrow limits, but the chemist, not content with probing out the secret, has learned how to modify it in many ways. A certain United States patent discloses methods for producing a soft glow or an intense light, and it names many chemicals for increasing the efficiency under a variety of operating conditions. It also tells how to add certain dyes and so produce light in a variety of colors.

"Perhaps the fire fly's curiosity would be aroused at this latest twist. Surely some color variation would be added glamor to its summer night cruises."

How many times have you heard the old bromide "hind sight is better than foresight" with the fire fly an implied symbol? More idiom of the "old days!"

*—By Bessemer*

# NOW - ONE SOURCE OF SUPPLY...



**FLANGED TYPE *Conical End* FITTINGS**

... fabricated from stainless steel type 316 for use with commercial tolerance light gauge tubing having outside diameters from 1" thru 10". Easily assembled with lightweight, high strength couplings (as shown), which provide an extremely compact, flush, leak-tight union for working pressures up to 250 psi. Complete line of ells, tees, crosses, adapters, etc., polished or pickled finish.

**"*Zephyrweld*" WELDING FITTINGS**

...in sizes from 1" thru 24" O. D., fabricated in gauges from 16 to 10, for use with stainless steel light gauge O. D. tubing, under broad corrosive conditions requiring semi-permanent or permanent welded line installation. Complete line of ells, tees, crosses, adapters, etc., in stainless steel types 304, 316, 347 . . . available polished or pickled finish.

## FOR ALL 5 STAINLESS STEEL

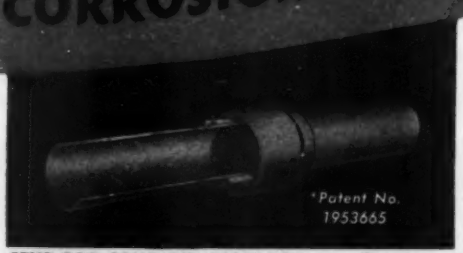
**"*Sanitary*" TYPE FITTINGS**

... available in both stainless steel and nickel alloy in a complete range of fitting and valve types, from 1" thru 4"—Includes all fittings accepted and approved by International Assn. of Milk Sanitarians, U. S. Public Health Service and Dairy Industry Committee.

***Recessed-End* FITTINGS**

... a new, complete line of ells, tees, crosses, etc., for soldering, brazing or welding... provides fast, low cost line installation—available in stainless steel types 304-316-347, in either pickled or polished finish. Sizes from 1" thru 10".

## CORROSION-RESISTANT FITTING TYPES!




**THE *Wallace* PIPE UNION***

... fabricated from stainless steel type 316, permits the use of thin wall stainless steel tubing in connection with standard threaded iron pipe size fittings of all kinds... saving from 25% to 45% in material without any loss of effectiveness. Available polished or pickled finish.

***SEND FOR COMPLETE CATALOGS . . . All 5 types of TRI-CLOVER fittings are fully described and illustrated in individual catalogs. Send for your copies today, mentioning in which of the types you are interested.***

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Kenosha, Wisconsin

TRIALLOY AND STAINLESS STEEL SANITARY FITTINGS, VALVES, PUMPS, TUBING, SPECIALTIES

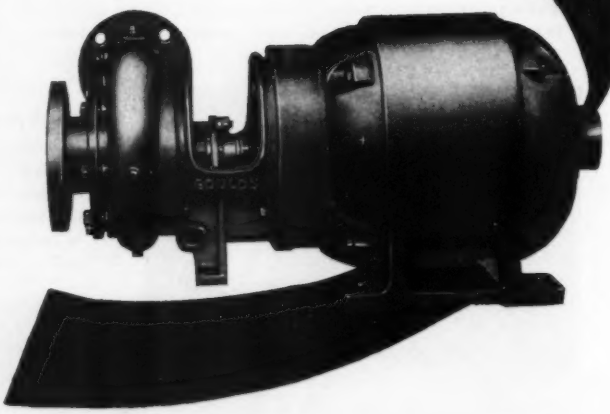
FABRICATED STAINLESS STEEL INDUSTRIAL FITTINGS AND INDUSTRIAL PUMPS

THE Complete LINE

# NEED PUMPING CAPACITY IN A HURRY?

**PROMPT FACTORY DELIVERY**

on all sizes of Goulds New "Close-Cupld" Centrifugal pumps tailored to meet your specific requirements. "The pump for the job" quick! Available both bronze fitted, all-iron, and all-bronze.



## THE "CLOSE-CUPLD" CENTRIFUGAL

**17 sizes . . . capacities to 2000 G.P.M. heads up to 400 ft., depending upon capacity.**

All you do is set this compact pump in place, connect it up and turn on the current. These new "Close-Cupld" Centrifugals answer a broad range of requirements *at low cost.*

### *These features save time, prolong pump life:*

1. Shaft sleeve covers all of the shaft. Compression seals at both ends of sleeve completely protect shaft from liquid damage. Unlike most pumps, the shaft sleeve is free to expand or contract with temperature—which prevents buckling and distortion.
2. Machined stuffing box designed for die-formed, semi-metallic packing or mechanical seal *without* necessity of making machining changes . . . gives you operating flexibility.
3. Liquid deflector, mounted on end of shaft sleeve prevents leakage of liquid into motor bearing . . . is drilled and tapped so that it can be used to prevent shaft rotation while removing or tightening impeller nut; also, to remove sleeve . . . saves time.
4. New type split gland saves time when you repack stuffing box.

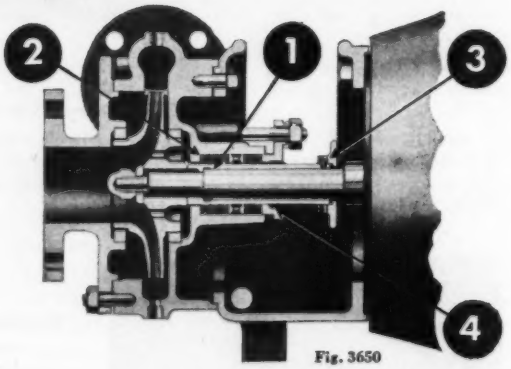



Fig. 3650

### *Also available for prompt delivery:*

**The "Support-Head" Centrifugal** . . . iron, bronze fitted and bronze 26 sizes . . . capacities to 3000 G.P.M. . . . heads up to 500 ft., depending upon capacity.

**Extra-heavy,** well-proportioned construction throughout the "Support-Head" series assures trouble-free operation 24 hours per day under the most severe service conditions.

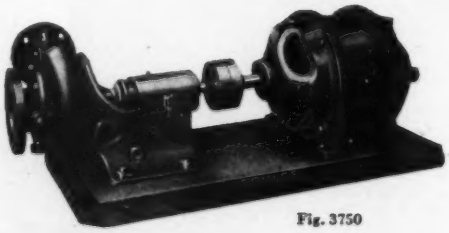


Fig. 3750

**FOR COMPLETE INFORMATION** on these new Goulds pumps see your Goulds dealer or phone or write pump headquarters.

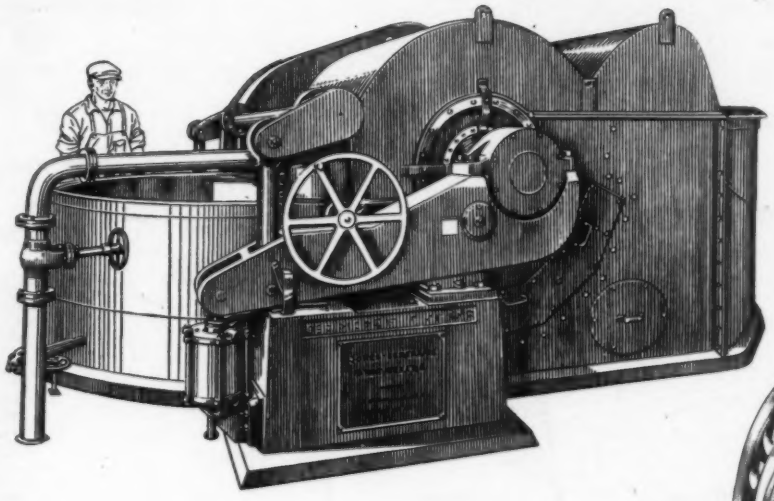
**GOULDS PUMPS, INC. • SENECA FALLS, N. Y.**

# GOULDS

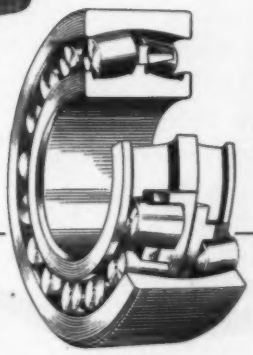
PUMPS, INC.

the PUMP FOR the JOB

# Torrington Spherical Roller Bearings Help You Get Uniformly Refined Fibre



*Assured alignment and low friction secured on beater rolls of Jones-Bertrams Beaters produce higher quality stock with reduction in starting torque and maintenance needs and increased beating capacity.*



**...low maintenance and lower starting torques are other advantages of these efficient Torrington Bearings in paper mill equipment.**

The accuracy and permanence of alignment of beater rolls assured by Torrington Spherical Roller Bearings help produce consistently good results in beating paper stock. Higher product quality is secured with a reduction in starting torques, too . . . 19-ton rolls rotate so freely that they may be turned over by hand after installation in the beater.

Add to these advantages the reduction in lubrication and maintenance costs . . . the high safety factor under heavy radial and thrust loads . . . self-alignment under deflection—all benefits that may be secured through the use of Torrington Spherical Roller Bearings in calender rolls, chippers, beaters, Jordan engines, presses and paper dryers, screens and similar paper mill equipment.

Whatever your bearing requirements, it will pay you to consult Torrington's engineers, whose specialized experience in the design, manufacture and application of all major types of anti-friction bearings is at your disposal. Call or write nearest Torrington office.

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**TORRINGTON** *SPHERICAL ROLLER* **BEARINGS**

**SPHERICAL ROLLER · TAPERED ROLLER · STRAIGHT ROLLER · NEEDLE · BALL · NEEDLE ROLLERS**

# Impco

## Impco bleaching equipment for sulphite, sulphate, soda, groundwood and special fibres

Because Impco supplies all necessary handling equipment "from the time the pulp is cooked until it is ready for the beater room" it offers integrated layouts with a single responsibility on the supplier.

# BLEACHING EQUIPMENT
## Post-war Installations

*Improved* **PAPER MACHINERY CORPORATION**

NASHUA · NEW HAMPSHIRE

A-14

# 16,236 Holes, Every Edge Clean and Smooth

## *Because Ryertex is More Uniform*

The uniformity of Ryertex is left to no chance of nature. Layers of tough cotton fabric, impregnated with phenolic resin are molded together under heat and pressure to form a completely uniform material.

That's one reason why more and more mills are selecting Ryertex for suction box covers, forming boards and pipe covers.

The six giant single-piece covers shown here will increase operating economy for a big southern kraft producer. Though drilled with a total of more than 16,000 holes not a single edge is rough or burred. The Ryertex is knot-free and will not splinter or crack; so there's no danger of the stock catching, building up and clogging the cover.

Completely uniform structure also eliminates hard and soft spots. Ryertex wears evenly. And it wears longer—often two to ten times longer, because Ryertex is stronger and has a lower coefficient of friction.

Easy resurfacing and longer life for felts or wires are other Ryertex economies.

Ask for a Ryertex engineer to consult with you on suction box cover problems and demonstrate Ryertex advantages. No obligation, of course.

Joseph T. Ryerson & Son, Inc., Ryertex Division: Chicago, New York, Los Angeles.

# RYERSON - RYERTEX

THE PAPER INDUSTRY
and PAPER WORLD

MAY 1948

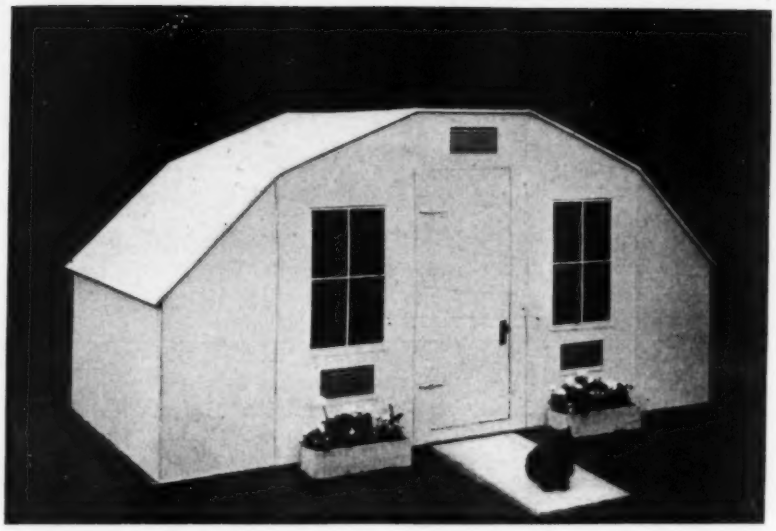

*Fig. 1—The completed paper house, Aug. 1944*

# An Experimental Paper House*

**J. A. VAN den AKKER, Research Associate**
**W. A. WINK, Technical Associate**
**The Institute of Paper Chemistry**

▶▶▶ DURING THE WAR, the Office of Production Research and Development of the War Production Board asked The Institute of Paper Chemistry to develop an inexpensive, portable paper house. The paperboard shortage had not yet become severe, and fortified paper was one of several materials which might be employed successfully in the production of portable, expendable shelters. Such shelters were to be of a type which could be mass-produced and which would be suitable for quick movement, in large numbers, into areas where the population had been rendered homeless by fire, flood, or other disaster.

Specifications suggested by OPRD included:

1) The materials of construction should be cheap and relatively noncritical

2) The house should be as light as possible, and be portable in knockdown condition

3) It should have a floor area equivalent to 8 ft. by 16 ft.

4) The house should not require a special foundation, but should be so designed that it could be assembled readily on flat ground

5) The house should have a life of one year and be capable of withstanding the weather hazards of the four seasons—viz., strong winds, rain, ice, and snow

6) The walls and roof of the house should have sufficiently low thermal conductance to permit economical heating during the winter months, and to provide comfort (with ventilation) during the summer season

7) When ready for shipment, the dimensions of the packaged house should be such that it could be shipped by all common carriers, including cargo planes

The experimental house described in this article was developed in an attempt to meet the foregoing specifications. A photograph of the house taken shortly after its erection is presented in Figure 1.

## Materials of Construction

It seemed self-evident that the basic material of construction should be paperboard of a type commonly manufactured by the paperboard industry. In view of the increasing scarcity of virgin pulps during the war, the paperboard chosen was chipboard, which is fabricated from waste paper only. In addition to this reason, chipboard is permeable and can be readily impregnated with fortifying agents after manufacture.

Unimpregnated chipboard is, of course, far too weak for use as a material of construction and, when in contact with a very humid atmosphere or water, loses its stiffness and other strength characteristics. Resins which are known to impart good strength to paper, such as phenol formaldehyde and urea formaldehyde, were considered to be too scarce and costly. On reviewing a number of possible fortifying agents, two materials, asphalt and sulphur, appeared to be outstanding with regard to cost and supply. Although asphalt is notable for its ability to impart resistance to both liquid water and water vapor when used in conjunction with paper as a coating, impregnating, or laminating material, its use in this project was ruled out in consideration of the *mechanical* properties of paperboard impregnated with asphalt. In view of the need for minimizing the amount of wood and metal employed in the paper house, the house was made *frameless*. This condition introduced unique problems of design. In a small shelter, the strength resides in the framework and materials such as tar paper serve only the purpose of providing a skin over the framework; except as it may add to the resistance of the shelter against racking stresses, the skin is not a load-bearing element of the house. However, in a frameless structure the panels of the walls and roof are the main structural elements of the house, and are subjected to sustained loading. Organic materials undergo

(*) This report is published by permission of the Office of Research and Development of the Civilian Production Administration.

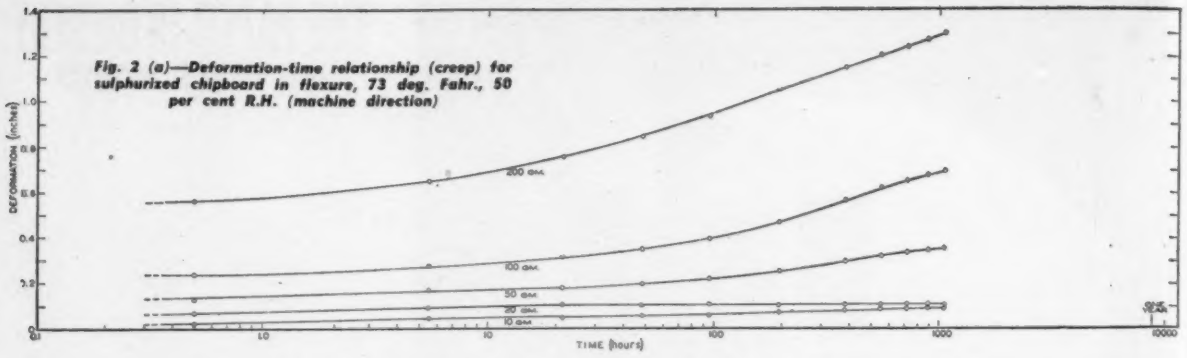


*Fig. 2 (a)—Deformation-time relationship (creep) for sulphurized chipboard in flexure, 73 deg. Fahr., 50 per cent R.H. (machine direction)*

creep when subjected to sustained loads over long periods of time. The direct manifestation of creep is increasing deflection under a given load with time, the deflection after many months being several times greater than the "instantaneous" deflection of the kind ordinarily observed in testing laboratories. The creep displayed by asphalt-impregnated paperboard is far too great to permit the use of asphalt in structural elements.

It has long been known that paper impregnated with sulphur possesses desirable mechanical characteristics. Sulphur is brittle and not particularly strong, and chipboard is among the weakest of all paperboards, but sulphurized chipboard (50 per cent sulphur content) is surprisingly hard and strong. Nails can be driven through this material without the production of cracks or fissures, and other shop operations, such as sawing, can be done with ease. Apparently the fibers of the board reinforce the sulphur and impart toughness and resistance to impact.

Creep data for sulphurized chipboard, required for design considerations, were obtained in atmospheres controlled at 73 Fahr. and 50 per cent R.H. and at 100 Fahr. and 90 per cent R.H. These data were obtained with four instruments, each one of which subjected five test specimens to cantilever loading. These instruments were designed to produce bending about a vertical axis, so that stresses originating in the weight of the specimens were negligible. The observed deflections for sulphurized chipboard are presented in Figure 2 (a) and (b), in which time is plotted on a logarithmic scale in accordance with established practice in creep studies.*

For any given, long period of time after the application of load, the total deflection of a test specimen in the creep test is very nearly proportional to the applied load. This makes it possible to calculate a so-called "delayed modulus of elasticity," which can be employed in engineering formulas to calculate the deflection of members after the given time of sustained loading. (There is apparently no critical load, below which no appreciable creep takes place.)

Computations of instantaneous (E) and delayed ($E^1$) moduli of elasticity of kraft Vls board of good quality (unimpregnated) and sulphurized chipboard are given in Table 1. The severe effects on creep of high relative humidity and temperature should be noted. For example, the delayed modulus of elasticity for kraft board at one year in the hot-humid atmosphere was roughly one-tenth of the instantaneous modulus in the standard atmosphere (50 per cent R.H./73 Fahr.) and the

(*) The apparent absence of appreciable creep in the specimen subjected to a 20-gram load [Figure 2 (a)] is attributed to a slight warping of that particular specimen.

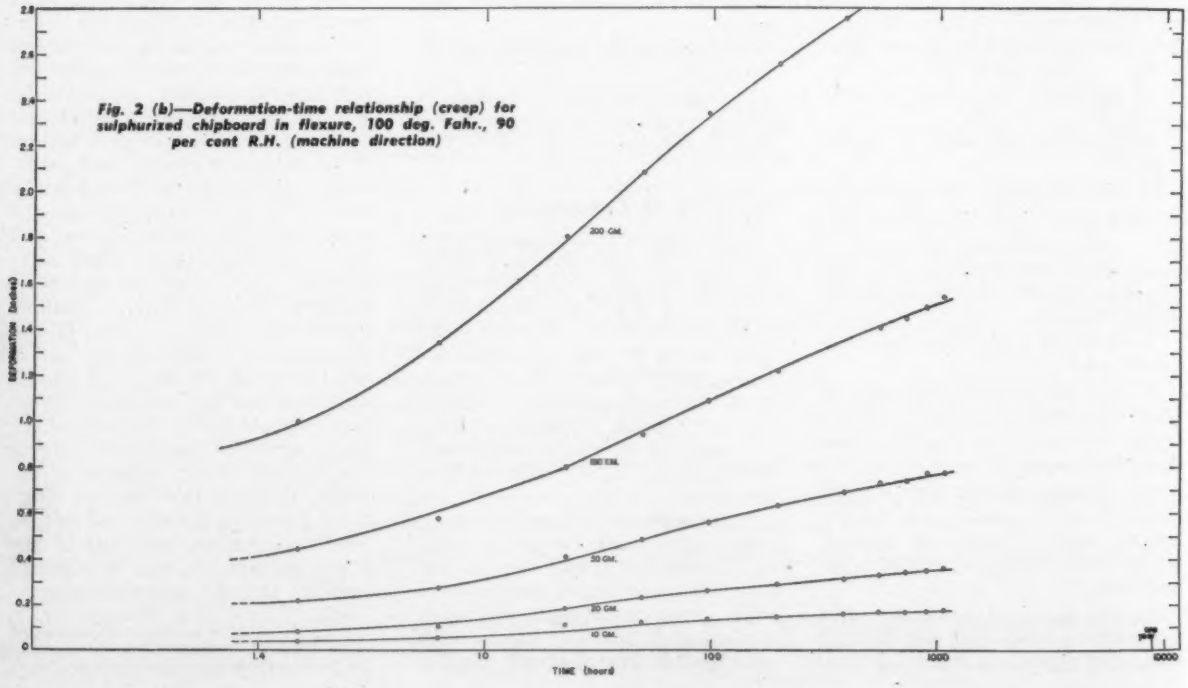


*Fig. 2 (b)—Deformation-time relationship (creep) for sulphurized chipboard in flexure, 100 deg. Fahr., 90 per cent R.H. (machine direction)*

*Fig. 3—Sulphurizing equipment at the Institute*

instantaneous modulus in the hot-humid atmosphere was about 60 per cent of that obtained in the normal atmosphere. The fortifying effect of sulphur is shown in the calculated moduli of elasticity of the sulphurized chipboard. The instantaneous modulus of this material in the normal atmosphere was about 1,600,000 psi, which is more than twice the modulus of the kraft board in the same atmosphere. This figure places the sulphur-impregnated chipboard in the class of the strongest hardwoods and even in the lower portion of the bracket of paper-base plastics. The delayed modulus of the sulphurized chipboard at one year in the hot-humid atmosphere was found by extrapolation to be not less than 210,000 psi, which is roughly three times the delayed modulus of the kraft board under similar conditions of grain direction, atmosphere, and time. These data showed that it should be possible to use sulphurized chipboard in the construction of a shelter in which the wall and roof panels would also be the structural elements of the house.

Figure 2, which is reproduced here for illustrative purposes, presents data on creep in sulphurized chipboard for the machine direction (grain direction) only. In view of the basic design of the panels employed in the paper house (described in a subsequent section), the machine direction modulus is of primary interest. However, it was necessary for design purposes to obtain the instantaneous and delayed moduli for the cross-direction and these were found to be, respectively, 850,000 psi (instantaneous in normal atmosphere) and 100,000 psi (extrapolated to one year in the hot-humid atmosphere). The moduli for the cross-direction thus seem to be of the order of one-half the corresponding moduli for the machine direction.

The delayed moduli of elasticity were employed in connection with long-time deflections resulting from the weight of the structure. However, the instantaneous moduli were used to estimate the effect of such transient loads as that produced by a high velocity wind.

The physical characteristics of the chipboard used in this development are given in Table 2.

The two major defects of sulphurized chipboard—viz., low strength after 24-hour immersion in water, and inflammability—were largely removed by surface treatment of the impregnated board. The creep experiments conducted in the hot-humid room indicated that water vapor *per se* did not produce undue weakening of the board. Experiments on the water immersion of sulphurized chipboard showed that the material failed to regain its strength after drying. This indicated that the liquid water caused sufficient swelling of the cellulosic fibers to crack the brittle sulphur bonds; it was reasoned that a suitable paint film, although not impermeable to water vapor, would protect the material by withholding the penetration of liquid water. Certain paint films also proved to be very effective in increasing the fire resistance of the material. (All experiments designed to increase fire resistance by preliminary impregnation of the chipboard with fireproofing agents were unsuccessful, presumably because the sulphur, before burning, melted and flowed to the surface, where it could burn freely. However, a suitable external film prevented this behavior, and several coatings were found which increased flame resistance to the point where small specimens tested in the laboratory qualified as self-extinguishing.) The most effective paints included ordinary aluminum paint, a commercial paint containing alkyd resin, and a fireproof paint developed at the Forest Products Laboratory (U. S. Department of Agriculture, Forest Service, Forest Products Laboratory, "Fire-retarding coatings." Mimeo. No. R-1280. Revised Nov., 1943). In view of the critical nature of other materials during the war, the last named paint was employed in this development. However, note should be made of the fact that very good results were obtained with an alkyd resin paint (a Sherwin-Williams "Dyal") of suitable composition, and that alkyd resin paint has high resistance to weathering.

It should be mentioned that a material qualifying as "self-extinguishing" on the basis of a laboratory test (Federal Specifications L-P-406a for organic plastics, Method No. 2021, was employed) may not be fireproof when in the form of a large stucture. However, a large structure could be ignited only by means of a sizable flame, and it is probable that combustion would proceed at a slow rate—if, indeed, it progressed at all. The experimental paper house is still in existence, and it is not yet desired to perform the flammability test on the full-scale structure.

**TABLE 1—Moduli of Elasticity of Kraft Board and Sulphurized Chipboard in Atmospheres of 50% R.H./73 deg. Fahr. and 90% R.H./100 deg. Fahr. (Machine Direction)**

| Material | Atmosphere | $E_{0.5\ hr.}$ (psi) | $E'_{1000\ hr.}$ (psi) | $E'_{1\ year}$** (psi) |
|---|---|---|---|---|
| Kraft board | normal | 700,000 | 370,000 | 320,000 |
| Kraft board | hot-humid | 410,000 | 106,000 | 73,000 |
| S-chipboard | normal | 1,600,000 | 560,000 | 410,000 |
| S-chipboard | hot-humid | 1,000,000 | 250,000 | 210,000 |

(**) Extrapolated, assuming no leveling off of curves; hence, minimum values.

**TABLE 2—Physical Characteristics of the Chipboard**

| | |
|---|---|
| Basis weight, lb./1000 sq. ft. | 143 |
| Caliper, inch | 0.042 |
| Specific gravity | 0.66 |
| Bursting strength (Jumbo Mullen), psi | 104 |

## Sulphur Impregnation

Laboratory experiments showed that the most effective results were obtained when the *dry* chipboard was immersed in molten sulphur at a temperature lying between 134 and 140 C. (It has been contended by others that best re-

sults might be obtained with dampened board.) Sufficient impregnation of two-ply board was obtained with an impregnating time of ten minutes. Care should be exercised to see that the temperature does not rise substantially above 140 C. because the fiber is then needlessly weakened by the elevated temperature and, if the temperature is excessive, the sulphur undergoes a structural modification causing its viscosity to rise to such high values that impregnation would be slow or incomplete. On the other hand, the temperature should not be too close to the melting point of sulphur (120 C.) because the heat required to elevate the temperature of the chipboard would tend to produce solidification of the sulphur, and heat losses following the impregnation would cause the sulphur to solidify before the excess had drained from the impregnated board. A photograph of the impregnating tank used for the sulphurizing of the panels in the experimental house is reproduced in Figure 3. The tank is of welded steel construction and is 5 ft. wide, 9 ft. long, and 2 ft. deep. A steam heating coil comprised of pipe running lengthwise of the tank and equipped with return bends is located in a plane about two inches above the bottom of the tank. The steel frame shown in Figure 3 is designed to support the panel and maintain it in a flat position at all times during the impregnating operation; its weight was chosen to hold the panel under the surface of the molten sulphur (the density of completely impregnated chipboard is substantially less than that of molten sulphur, the two specific gravities being, respectively, about 1.4 and 2.0). The frame is of welded steel construction, comprised of a main rectangle 50 inches wide and 98 inches long made with 3 inch by ¼ inch angle iron. Smaller angle irons, 1½ by ¼ inch, are welded to the frame in a crosswise manner on 1-foot centers; these are so oriented as to present one face flush with the supporting faces of the main frame.

Removable iron rods pass crosswise through holes in the flanges of the main frame, providing a means for holding the panel down when in the sulphur bath. The clearance between these rods and the supporting surfaces of the frame is about one and one-eighth inches. After a panel is laid into the frame, four 8-foot iron straps of dimensions 1 inch by ⅛ inch are laid lengthwise upon the panel, and the rods, which bear down upon these straps, are pushed into place. Thus, the panel is constrained to be flat by members lightly bearing upon it from above and below. (The flat surfaces which contact the panel do not appear to retard the impregnation of the sulphur in the contacted areas; apparently, the liquid sulphur penetrates into these zones by capillary action and then flows through these narrow spaces as penetration of the board occurs.)

By means of the hoist and overhead track shown in Figure 3, the frame and panel are lowered into the sulphur and maintained at an elevation just below the bath level during the impregnating period, which was usually 15 minutes in the case of complete panels. The steel cables connecting the frame to the hoist were so arranged that the suspended frame was inclined upward from the back to front edges. This inclination favors the flow of the molten sulphur up through the spaces of the open web of the panel. During the first few minutes of the impregnating operation, the moisture in the board is driven off in a rather active ebullition.

Following the impregnation, the frame is held above the bath at a sharply inclined angle to permit quick drain of the excess sulphur. Small areas on the top liner having an excess of sulphur may be easily and readily cleaned by wiping with rags while the panel is still hot. (In an industrial operation, the impregnating system would logically be designed for continuous flow of materials, and excess sulphur would be removed by doctor blades or doctoring rolls.)

Before solidification of the sulphur, the impregnated chipboard is quite weak and flabby and, hence, must be supported by suitable framework. However, the sulphur solidifies quickly, and the panel may be safely removed from the frame and subjected to further operations a few minutes after the impregnation.

## Basic Structure of the Panels

Where the panels of a structure must serve as the structural elements, considerable over-all thickness must be employed, because there is no other feasible way of obtaining the necessary stiffness. Furthermore, weight consideration indicated the necessity for an open web design. Using a design of the house like that finally adopted (Figures 1 and 5), preliminary calculations indicated that the panels should have an over-all thickness of about two inches and should contain a corrugated medium forming trapezoidal cells if the house were successfully to withstand such hazards as high velocity wind, heavy snow loads, etc., with a good safety factor. However, space limitations imposed on the house in packaged form argued against the 2-inch thickness, and a further difficulty was anticipated in the commercial production of a corrugated medium of such large dimensions and unusual shape. Accordingly, an over-all thickness of 1-inch and a corrugated medium of the usual sinusoidal shape were adopted for the laboratory design and fabrication. A cross section of the panel is shown in Figure 4. The liners each consist of pasted, two-ply chipboard, and the corrugated medium is formed from the single-ply, 42-chipboard.

## Design of the Experimental House

All floor, wall, and roof panels of the paper house have the basic structure shown in Figure 4. A front elevation of the house is shown in Figure 5; except for the door, this may also be viewed as the rear elevation. The roof panels, of which there are five, are a little less than 8 ft. long and the floor panels, of which there are four, are in direct contact with the ground. The bottom surface of the floor is flush with the lower edges of the wall panels. Wooden 2 by 4 inch stringers are located below the outer periphery of the house, and serve to sustain the load imposed by the walls and roof. In the absence of such stringers, the joints between the walls and the floor would be subjected to damaging stresses.

The contacting surfaces of all adjacent panels are joined by means of metal connectors, as shown in Figure 6. The edges of the liners of all panels were furnished with galvanized steel flanges F, which were riveted to the impregnated board. (The liners of each panel extended a fraction of an inch beyond the corrugated medium.) Metal H-connectors, shown in Figure 6 (c), were slipped into the joint from one end, thus forming a strong connection

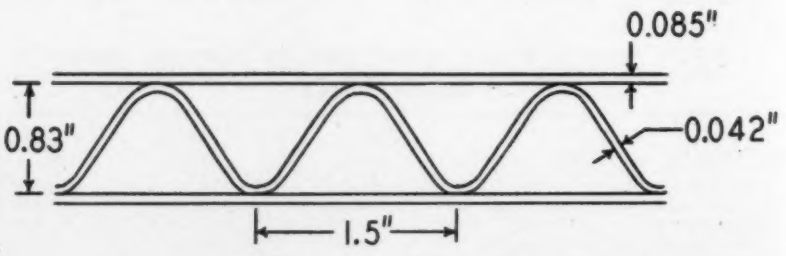


*Fig. 4—Cross section of the sulphurized, corrugated chipboard*

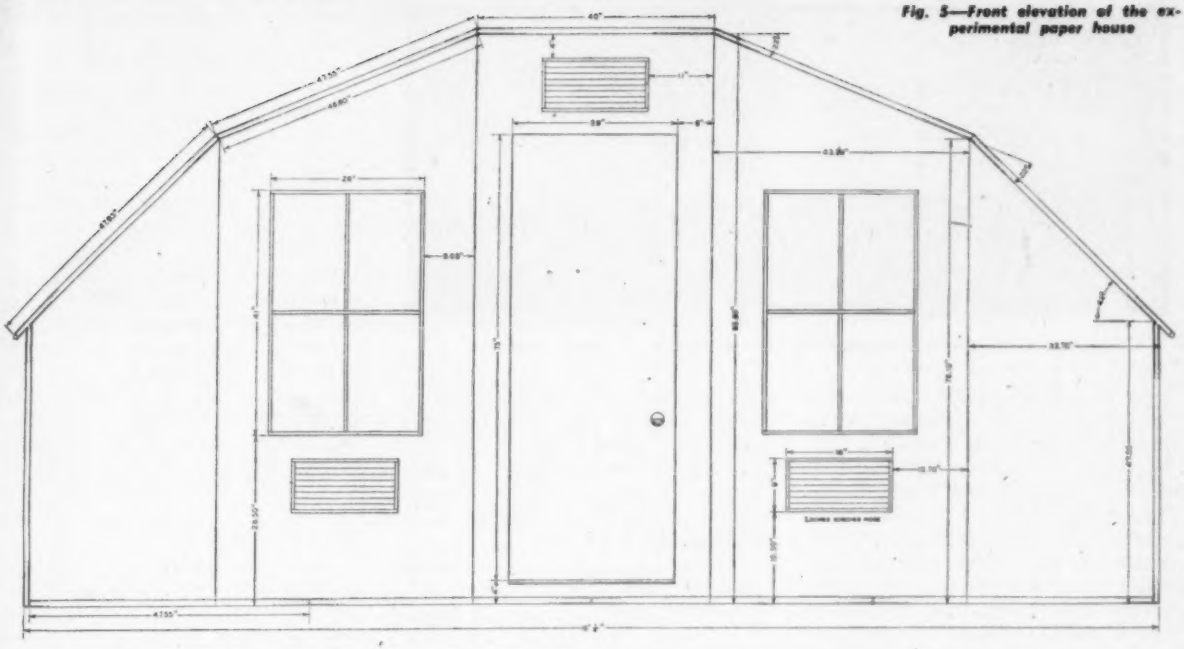

*Fig. 5—Front elevation of the experimental paper house*

resisting stresses tending to separate adjacent panels, or tending to produce relative side motion. (All 21 panels of the house are numbered, and are erected in a definite sequence so that the H-connectors may be slipped into place without difficulty.) The machine direction of the floor panels, the two side wall panels, and all roof panels run from front to rear. The machine direction of all front and back wall panels is vertical. Although the main reasons for these orientations are structural, an important consideration is the fact that sulphurized chipboard has a small, but noticeable hygroexpansivity —on going from a prolonged damp spell to dry weather, there will be a small over-all shrinkage of the house, and the distorting effects are minimized through choice of the machine-direction orientation just described.

It is important, in laying the plans for a structure of this sort, to realize that the chipboard undergoes a contraction during the impregnating process because of the loss of moisture occurring during the impregnation. Accordingly, all plans for the house were furnished with two sets of dimensions: one set were the desired final dimensions, and the other set were the dimensions of the panels prior to impregnation. A convenient rule in the present development was a shrinkage of 0.2 inch for both an 8-foot length in the machine direction and a 4-foot length in the cross-machine direction. The shrinkage for all lesser lengths was scaled proportionately.

The door was prepared from material cut (before impregnation with sulphur) from the middle front panel. The door and the door frame are trimmed with galvanized sheet iron. In addition to the door, there are four double plastic windows set in light wooden frames. The plastic is "Ethocel" sheeting manufactured by the Dow Chemical Company. This material was selected in view of its low hygroexpansivity and, therefore, freedom from tightening and bulging occasioned by alternating dry and damp weather. The double windows provide a one-half inch air space which furnishes relatively good thermal insulation. The windows are held in place by strips of 42-point chipboard impregnated with sulphur. These strips are glued around the frames to the panels and calking is employed to prevent entry of water. Ventilation is provided by six screened louvers. Four of the louvers are arranged directly beneath the windows, and one each is located near the top of the front and rear central panels. These louvers are equipped with shutters on the sides facing the enclosure. The frames of the louvers, like those of the windows, are made of wood, and are sealed in place with a calking compound and strips of sulphurized chipboard.

A safety ring for a stove pipe is arranged near the top of the rear central panel.

Although the furnishings are not an essential part of the house, it may

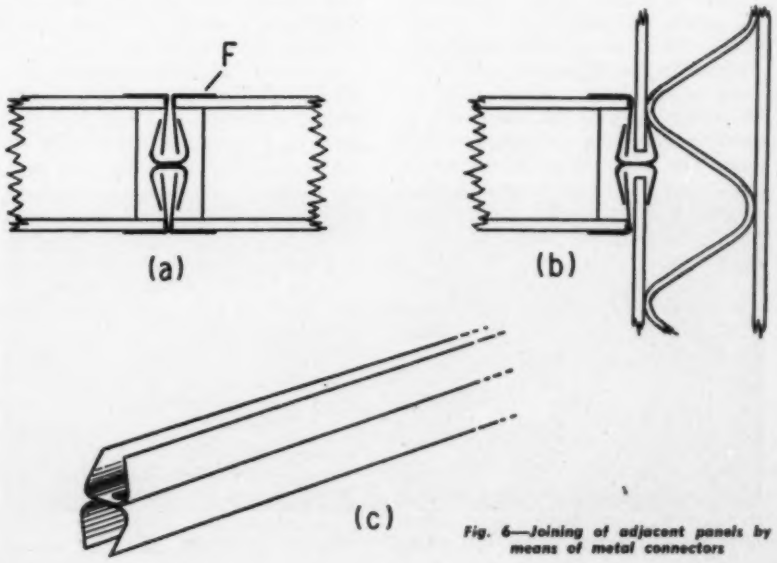


*Fig. 6—Joining of adjacent panels by means of metal connectors*

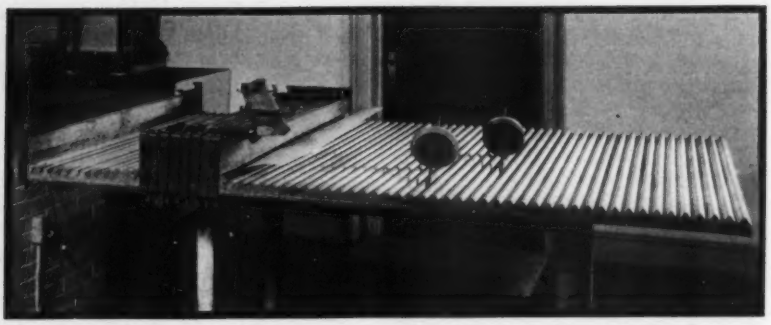

*Fig. 7—Die for the laboratory fabrication of "jumbo" corrugated board*

be of interest to record that the experimental house was furnished with a paper rug, paper roll curtains, an oil-burning stove (thermostatically controlled), and two double deck bunks. The double deck bunks, of low elevation, were arranged at each end of the house, running from front to rear, thus providing a central living space.

The shape of the roof is a matter of considerable importance to the overall rigidity of the house. The planes of all contiguous roof panels meet with an angle of 22 degrees, producing a steepest slope of 44 degrees with the horizontal. In addition to imparting good rigidity to the whole house, this arrangement of the roof panels results in good edge support of the individual panels, enabling them to carry much heavier loads than would be possible were the panels arranged in a flat, horizontal roof. In addition, good head room (8 feet at the center) is provided throughout most of the house and there is ample room at either end for bunks or storage.

## Laboratory Fabrication Of the Panels

It should be emphasized that there is a vast difference between laboratory and commercial production of panels. In the absence of a jumbo corrugating machine, the experimental panels were made by hand and, accordingly, the following description of our laboratory methods should be considered in this light. The basic design of the corrugated panels is such, however, as potentially to permit rapid production on suitable corrugating and combining equipment.

The laboratory panels were formed with the aid of a corrugating die which was made of hardwood by a local manufacturer. A photograph of this die is presented in Figure 7. It is comprised of 64 specially cut hardwood pieces, screwed and glued to a 4 by 8 ft. plywood base. These pieces were formed by a high-speed cutter of the kind employed in the manufacture of molding, the cutter having been shaped to produce pieces which, when laid side by side, would form a wave having a trough radius of curvature of 0.25 inch and a crest radius of curvature of 0.21 inch. The die produces 8 full waves per foot in a corrugated medium separating the inner surfaces of the liners by a distance of 0.83 inch.

Ten of the specially cut hardwood pieces were mounted on wooden members which serve, as shown in Figure 7, to depress the 42-point chipboard into the die. In making the corrugation, a sheet of chipboard of the desired width and length is cut from a roll, lightly and uniformly sprayed with water, and fastened at one end by means of a depressing bar. A second depressing bar is then clamped into place, forming the paperboard into the second groove. Other bars are successively clamped into place until several hold the paperboard firmly in the die. The first bar is then "leap frogged" over all the others and is clamped into the foremost position; this is then done to the second, third, and other bars until the corrugating is completed. As the bars are moved from the rear to the front, one-half inch iron rods are laid into the groove to hold the chipboard in place. The clamping mechanisms each consisted of an adjustable iron C-clamp and an iron lever so shaped as to produce a toggle action (long iron straps were provided under the long edges of the corrugating die, and short straps on the tops of the depressing bars, to protect the wood from the forces produced by the clamping mechanisms.)

The laboratory corrugating arrangement could not produce the smoothing action provided by regular corrugating rolls (which exert high pressure) and the bend in the chipboard over the crests were not smooth, but exhibited a number of irregularities sometimes referred to in the board industry as "dog leg" breaks. These were eliminated by rollers, also shown in Figure 7, which produced the desired smooth round surfaces in the troughs and over the crests.

After a suitable drying period, wet-strength glue (Du Pont 77) was applied to the crest of the corrugated chipboard, the latter being held in the die by means of the previously mentioned iron rods. The glue applicator is shown in Figure 8. This device is comprised mainly of a steel roller, adjustably mounted in a frame, and a glue reservoir R. A long handle enables the operator to place the roller upon the far ends of a pair of adjacent crests, and pull the applicator toward himself, thus applying the adhesive to a pair of crests. The glue feeds onto the roller through a narrow slot between the roller and the bottom plate of the reservoir. Using this applicator, one operator can apply the adhesive to the corrugated medium in about two minutes. Reasonable speed is essential, because the glue applied to the first crests tends to strike into the chipboard and dry while the remaining crests are coated.

The liner was then laid upon the corrugation, and fairly uniform pressure was brought to bear by piling bags of scratch feed upon the top of the liner. This method of loading was chosen because the bags have suitable bulk, and the grain in the sacks "flows" rather easily. Approximately ten sacks, having a total weight of about 600 lb., were uniformly distributed over the liner. When the adhesive had set, the liner, with adhering corrugated medium, was moved to a nearby room and was laid upon a large, specially prepared table having a very flat surface. The first liner was placed down, so that glue could be applied to the other side of the corrugated medium. After the final gluing, the second liner was laid upon the corrugated medium, and a second set of bags of scratch feed were distributed over the liner. After drying of the adhesive, the combined panel was ready for impregnation in the sulphur bath.

All trimming operations, such as removal of areas for windows and louvers, were performed prior to impregnation with sulphur. (Cutting, however, can be performed with ease on the impregnated chipboard.)

Following the impregnating operation, the panels were equipped with galvanized iron angle connectors as previously described. The final operation, prior to erection of the house, was painting of the panels with the fireproof paint.

## Weight of the Experimental House

The 21 panels of the paper house are shown, prior to erection, in Figure 9. The weight of these panels and other essential parts of the house were as follows:

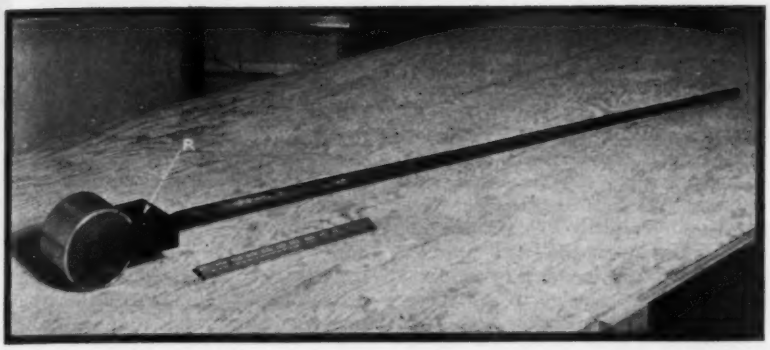

*Fig. 8—Glue applicator*

| | |
|---|---|
| Total weight of panels, inclusive of louvers, exclusive of windows | 981 lb. |
| Total weight of connectors | 29 |
| Weight of 4 windows | 19 |
| Total weight of experimental house | 1,029 lb. |

Thus, in rough terms, the weight of the house is ½ ton. If the floor is provided with a dense fiberboard floor covering (such as "Presdwood") to protect the floor panels from puncture with sharply pointed objects, approximately 130 lb. should be allowed for such covering, making the total weight about 1,160 lb.

### Estimated Cost of the Material For the Paper House

In round numbers, the weight of chipboard used in the paper house was 490 lb., and an equal weight of sulphur was consumed in the impregnating operation. If we include the weight of the panel material removed for windows and louvers, and disregard the waste paper value of this "broke," the amount of chipboard required would be 525 lb. At the time of the construction of the house, the cost of chipboard, delivered in rolls, carload lots, was $48.00 per ton, or 2.4 cents per pound. Hence, the cost of the chipboard was $12.60. The cost of crude sulphur, delivered, was close to 1.0 cent per pound and, therefore, the cost of the sulphur required for the house was about $4.90, making the total cost of the chipboard and sulphur $17.50. Allowing $8.00 for the four windows, $6.00 for the six louvers, $10.00 for fire-retardant paint, $10.00 for H-connectors, door latch, and other small fixtures, the total cost of materials for the *unfurnished* house was of the order of $51.50.

It should be emphasized that manufacturing and further costs must be added to the above figure to arrive at the final consumer cost of mass-produced shelters of this type. These costs cannot be estimated at this time, but it is obvious that they would depend upon such factors as fabricating methods, magnitude of the scale of operations, class of labor employed, kind of manufacturing plant engaged for the fabrication (e.g., container manufacturer, paperboard mill, manufacturer of prefabricated houses, etc., and extent to which existing equipment, such as corrugating and combining machinery, impregnating equipment, and the like, may be modified for the construction of the paper house).

### Performance of the Paper House

The main purpose of the experimental house is to demonstrate the possibility of an emergency type shelter of the kind described withstanding the weather hazards of one year and furnishing comfort to its occupants. In addition, the experiment would serve to demonstrate the weaknesses of design and materials and thereby furnish information of value to potential manufacturers of similar structures.

Erected on August 5, 1944, the experimental paper house has passed its two-year mark at the time of writing. During the first winter, the house was heated by means of a thermo-regulated oil burner, as previously stated. The temperature was controlled at about 65 Fahr. to simulate typical average night and day temperature of a sleeping room. During the period of cold weather from November 20, 1944 to March 22, 1945, when the temperature was often below zero Fahr., the total consumption of fuel oil was 208 gallons. This is a reasonably low fuel consumption for a one-room shelter. (Comparison with the fuel consumption per room of an ordinary house is not valid in view of the fact that the latter has only one or two surfaces out of six exposed to outdoor conditions, whereas a *one*-room house has all surfaces above the ground exposed directly to low temperature.) Although the over-all thickness of the panels is only one inch, relatively good thermal insulation is ensured by the open web construction. During the period from the fall of 1945 to the time of writing, the paper house has been used as an entomological laboratory space and, for convenience, heating has been through a thermo-regulated electrical heater.

The depth of snow on top of the house has never exceeded several inches, mainly because of slow melting resulting from transfer of heat through the roof. Although the shape of the roof does not favor the accumulation of snow, it is expected that, in certain localities, an *unheated* structure of this type might accumulate a sufficient load of snow to damage the roof members. Such accumulation, however, is not probable in an occupied and heated shelter.

Inspection of the house at the two-year mark shows that most of the panels are sound and strong. Several localized failures have been observed. The greatest damage has occurred in the steepest roof panel at the left (most southerly) end of the house as viewed in Figure 1. After the first winter, it was found that the paint on this panel had failed badly as a result of the intense exposure of this particular panel to sunlight. The paint formula, a good one as tested in our laboratory, was apparently disregarded when the larger batch of paint was compounded by a small paint manufacturer. The paint, as delivered by the manufacturer, failed to dry in a period of several

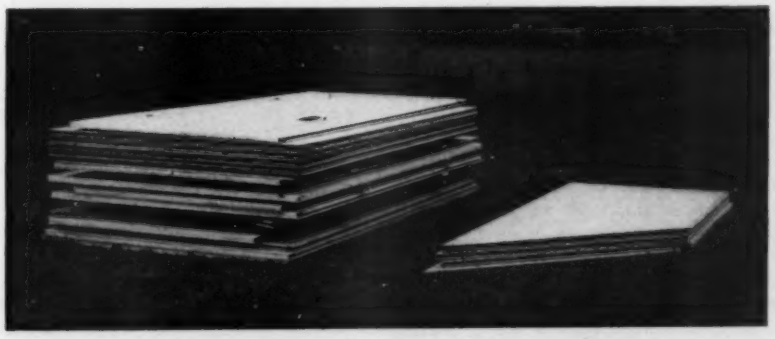

*Fig. 9—Panels of the experimental paper house prior to erection*

days, and had to be "doctored" with additional drier. As a result, the paint had poor quality and failed in its function of protecting the sulphurized chipboard from water. This damaged roof panel, although still sound at the one-year mark, displayed a very noticeable sagging when the house was nearly two years old. Localized buckling to a small, but noticeable, extent has occurred around the bottom edge of the house, where melting snow banks maintained a wet condition over long periods of time. The latter difficulty could be easily eliminated by suitable metal or wooden trim around the lower edges of the wall panels.

An error of design was noted in the top roof panel. This panel, which is horizontal, developed a slight sag, which caused it to retain a thin layer of rain water over long intervals following precipitation. As an expedient, this panel was covered by two narrow panels of "Presdwood," which were given sufficient slope to shed water.

In all other respects, the performance of the experimental paper house has been very satisfactory. It has successfully withstood several wind storms, two of which were sufficiently intense to break or uproot nearby trees. In one of these storms, the wind direction was most unfavorable, being directly against the rear face of the house.

The resistance of the panels to impact is rather good. An imperfect panel was used for testing this property. This panel was leaned against a stone wall, and a large rock was thrown against the panel at short range. A very hard throw caused perforation of the struck liner, but no damage visible from the other side could be produced.

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# Early United States Patents on Papermaking

RAYMOND G. McKENZIE

▶▶▶ FOR MANY AGES writing has been the means of transmitting and preserving the knowledge and thoughts of people. Without writing, many of us would know very little even about our own grandparents, much less about many people of all countries for thousands of years. Ancient peoples used stones, clay tablets, and similar means to convey their thoughts in writing to others, and to leave some of their knowledge to us of the present age. These means were at best of very limited utility and were an impossible means of recording a lengthy document of correspondence. Imagine telling your stenographer to get out her hammer and chisel and take a letter, or imagine a set of *Encyclopaedia Britannica* done in stone! Pity the mailman and the school boy!

The need and desire of people to put down their thoughts, desires, and knowledge in a more convenient manner resulted in the development and use of thinner and thinner stones and clay tablets. Crude inks were developed to replace the hand carving on large stones and cave walls, but still there was a limit as to how thin the stones and tablets could be made. Not until the Egyptians over four thousand years ago discovered that the papyrus, a tall, smooth-stemmed reed (then growing in great profusion along the banks of the Nile) could be made into a thin sheet was the stage set for a rapid advance in civilization. These sheets were made by peeling apart the some twenty successive layers of the lower part of the papyrus stem, arranging the separated layers side by side on a hard, smooth table; arranging another layer of the peelings at right angles to the first, and then pressing or pounding the two layers together, while damp, until a coherent sheet was obtained. A smother surface was obtained by rubbing the sheet with a smooth object such as a stone, a shell, or a piece of ivory. Long sheets were made by fastening the small sheets end to end. Some of these, as long as thirty feet, are in existence today. While these sheets were not paper in the sense we know it today, they served admirably well and in a large part because of them we know considerable about the ways of men four thousand years and more ago. Thousands of papri or rolls of these papyrus sheets are in existence in the libraries of the world today. It is to be wondered if such a percentage of our modern day papers will be in existence four thousand years from now.

The distribution and the amount of the papyrus reed was limited, other materials had to be found. The skins of sheep and goats, made into parchment, were used as a substitute by the Hebrews as early as 1085 B.C., and find some use even in modern times. Wooden boards or tablets engraved with writing were used by the early Romans; later these boards were coated with wax so that they could be written on with a sharp instrument. These boards could be used repeatedly by scraping off layers of the wax. Leaves of various trees were also used to write upon at a very early date.

Not until the beginning of the Christian era [Hunter (2), between 123 B.C. and 105 A.D., p. 109; Munsell (3), 95 A.D., p. 16, and Butler (6), 105 A.D., p. 20. The most generally accepted date is 105 A.D.] was paper, in the modern sense, discovered by the Chinese. Mulberry tree branches were boiled in lye to remove the bark. The inner bark, or what we now know as the cambium layer, was then removed and boiled in lye again until the fibers separated. The fibers were then washed and pounded with a mallet until they were reduced to a condition fine enough to be suspended in water. A liquor, resulting from cooking a mixture of rice and a root called "oveni" in water, was mixed with the fiber suspension and sheets were formed by dipping [Hunter (2) and

Butler (6) give quite different versions as to the actual forming step and type mold used.] a sieve or mold, made of plant fibers such as bulrushes or bamboo, into the suspension and allowing the water to drain away. The sheet or several at a time were pressed with weights and then allowed to dry in the sun. Thus the first truly water laid sheet came into existence. From this period on, the art of papermaking advanced, sometimes with spurts but mainly very slowly. Rice straw, hemp, bamboo, linen or flax fibers and cotton fibers were apparently used by the early Chinese—some writers mention silk but this appears doubtful as silk fibers do not felt well.

The art of papermaking spread slowly, mainly by war. The Arabs captured the city of Samarcand or Tartary from the Chinese shortly after the Saracens had conquered Egypt in 650. Both victors brought the knowledge of papermaking back to their respective countries. The Crusaders obtained the knowledge from the Arabs, again by war. In Europe, the art appeared in Spain about 1150, then spread to France fifty years or so later, to Italy in 1276, to Germany in 1390, to England in 1494 and to Holland in 1600. Apparently the art did not do well in England. Not until war with France, was papermaking in England entered into in anything but a very haphazard and limited extent.

In the meantime, the United States was in a period of gestation. The Colonies were fairly well established and a paper mill had just been started by Rittenhouse near Philadelphia. Very little is known about this first paper mill. Undoubtedly it was very small and primitive when compared with any mill operating today. Some idea of the equipment used in a very early mill is found in the following list included in a lease to Thomas Willcox from Thomas Brown in 1732.

*"A mortice and (ha)mmers, a Vatt and Pott, two Stuff Tubbs, a Rag knife and Block one press paper mould and a pair of Shop paper moulds, twenty-six fulling paper felts, Seventy-seven shop paper felts, two press paper Planks and a halting plank, two Shop paper Planks, a Press and Rag wheel, a screw and Box, a Glazeing Engine, two pairing knives, two little pails with iron hoops, one smal ads, two pairing frames—one pairing Bench, three cocks, two troughs, one winch, a halfting bench, two trassels, a Iron Barr, six posts and Eighteen Rails for hanging of paper, one hundred polls for hanging paper, one pad, one pair of Stilliards, a Box for Paper Hanging stool, one hundred and sixty Tap pots, Twenty cogs and three washers." (1)*

The above description shows that nearly the same equipment was used in 1732 as was used by the Chinese some 1700 years earlier. Not until about 1750, with the invention in Holland of the beating engine or Hollander, was the mallet of the Chinese laid aside.

By 1790, the United States had been formed and about 100 paper mills were operating in the various states. A modern mill of that time is described as follows:

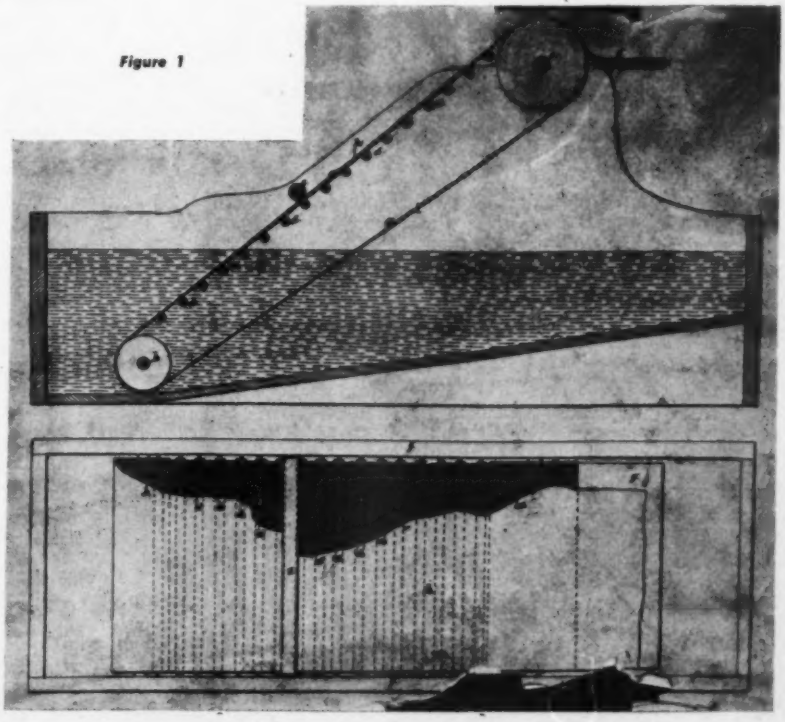
*"A building occupied as a Paper Mill, 36 x 32 feet, with two vats upon the ground floor, which have a Cast Iron pot in each of them, sunk into Brick chimneys, for heating the vats. The first floor has two engines for beating-stuff, a room for dressing rags, with a brick chimney and fire place, also two other rooms for rags. The second floor is occupied for a Rag warehouse.*

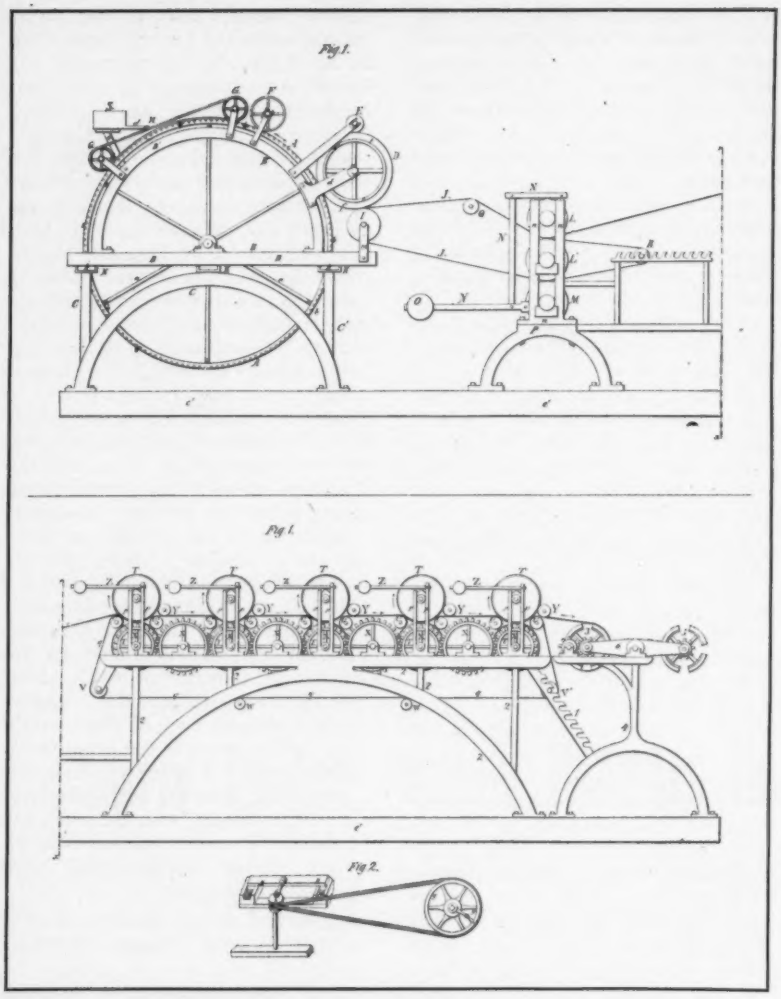
*"Another building connected to the mill by a covered passage way of 20 ft. long, used for drying and keeping paper before finished, 20 by 24 feet, at the end next the mill; a part of the drying-house is taken off for a finishing room, 27 by 24 feet, in which is a cast iron stove used in the winter season. At one side of the finishing-room is a sizing copper set with bricks and brick chimney. Another building 35 feet from the mill, that is 24 ft. by 20, for Rags and finished paper. Another building, 131 feet from the mill 20 by 13 ft., for Rope and other lumber." (1)*

Thus was the state of the papermaking art in the United States when on April 10, 1790, Congress, in conformity with paragraph 8, of Section 8, Article 1 of the newly adopted Constitution reading: "The Congress shall have power . . . to promote the progress of science and useful arts, by securing to authors and inventors the exclusive right to their respective writings and discoveries," passed the first patent act. The law provided for the granting of a patent on "any useful art, manufacture, engine, machine or device, or any improvement therein not before known or used." An inventor ("he, she, or they") was required to present a petition for letters patent to the Secretary of State, the Secretary of the Department of War, and the Attorney-General of the United States. Along with the petition; a written specification of the invention, a drawing and if possible a model were required. These had to be sufficiently detailed so as to distinguish the invention over things before known or used and sufficient for persons skilled in the art to make, construct, or use the same. The two Secretaries and the Attorney-General, or any two of them, could then grant a patent in the name of the United States, "if they shall deem the invention or discovery sufficiently useful and important." An oath was not required. Fifty-seven patents, none of which concern papermaking, were granted under this act.

A second patent act was enacted February 21, 1793. This act was similar

Figure 1





to the 1790 act, the main difference and a very important one, being the omission of "if they shall deem the invention or discovery sufficiently useful and important." This made the granting of a patent little more than a matter of registration. Nine thousand nine hundred and seventy-five patents were issued under this law. Fifty-nine of these appear to have concerned the papermaking art as covered by present Class 92 of the Manual of Classification of Patents (This article is limited mainly to patents classified in this class.). Other than the title, date of issue, residence of the inventor and the inventor's name (These are found in the Index of Patents issued from the United States Patent Office, 1790-1873), nothing is known of most of these patents as most of the Patent Office records were destroyed by fire late in 1836. A great deal of effort has and still is being expended in finding and restoring copies of these destroyed patents. At the present time only seven of the fifty-nine patents dealing with papermaking have been found and restored.

The first of these was issued jointly to E. F. and T. Blank, February 16, 1830. The patent concerns a leather paper for; "Patent Leather Caps, Pocket Books and for all kind of Book Binding" as well as "Sheathing paper and all uses." The disclosure states "The mode of forming the Patent Leather Paper is similar to that for manufacture of paper from Rags. The shavings (leather refuses, parings of shavings) being first ground or beaten to a proper consistence, are put into a suitable mold, from whence they are taken to the press." "The color of this paper may be varied according to the quality of the shavings used or by a chemical process. It may be brought to such a degree of fineness and whiteness, as to be equal to the finest writing paper." This last statement appears to be somewhat of an overstatement unless the "finest writing paper" of those days was rather poor. One commendable feature of this patent was that only five hundred words were used. The Blanks were apparently not the first to make paper from leather fibers as patents were issued to J. Confuit, Jr., December 28, 1801, for "Manufacturing Paper from Currier's shavings" and to J. M. Thorndyke, March 7, 1814, for "Using pelts for manufacturing paper."

The idea of using fibers other than rags was very intriguing to the inventors of this era; in fact, it was fast becoming a necessity as the supply of rags was always short and the demand for paper was steadily increasing. Various means were resorted to in an effort to increase the supply of rags; prizes were offered, resolutions by the various state legislatures were passed, contests were staged, even poems written about the need and still the supply of rags did not equal the demand.

**Figure 2**

Rags taken from the bodies of Egyptian mummies are known to have been used in large quantities during this period. Another source quoted by Weeks (1) is as follows:

*"At one time this mill (Bennington, Vt.) depended a great deal upon the cast off clothing of the Indians and it is believed that the aborigines were persuaded in many species ways, not always honest, to give up their clothing sometimes before it had really reached the rag condition."*

Many substitute materials were advocated as a source of papermaking fibers during these times. Patents were granted to R. Livingston, October 28, 1799, for the use of frog-spittle (a water plant); B. Allison and J. Hawkins, December 30, 1802, and J. W. Cooper, February 7, 1829, for the use of corn husks; A. Frost, March 19, 1904, and J. Tatterson, December 7, 1805, for machines for preparing flax tow for papermaking; S. Green, February 15, 1809, and E. H. Collier, April 15, 1828, for the use of seaweeds, and to L. Bromeister, September 10, 1829, and W. Magaw, March 8, 1830, for the use of straw and hay. These materials were only the beginning. Patents have been issued for making paper from every imaginable material. Garbage, street sweepings, leaves, manure, slaughter house wastes, fish, bones and flesh, ivory shavings, and peelings from most fruits and vegetables, the list is much to long to enumerate. While many of these suggestions seem rather fantastic at the present time, it must be remembered that the production of a mill ran into a few pounds of paper a day then, rather than hundreds of tons as now. Many materials could be then used profitably which could not even be considered now.

The second patent, No. 6048X, (Patents before 1836 are generally re-

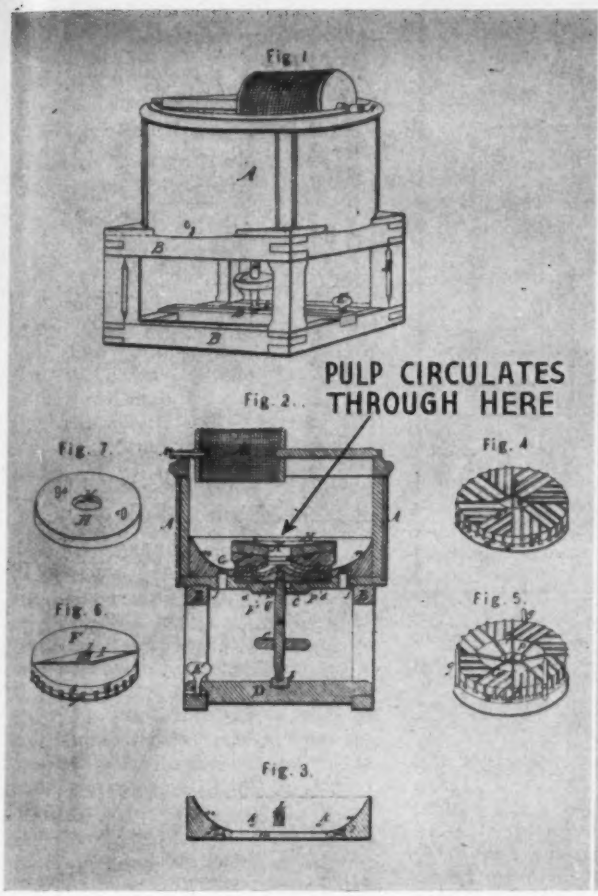



Figure 3

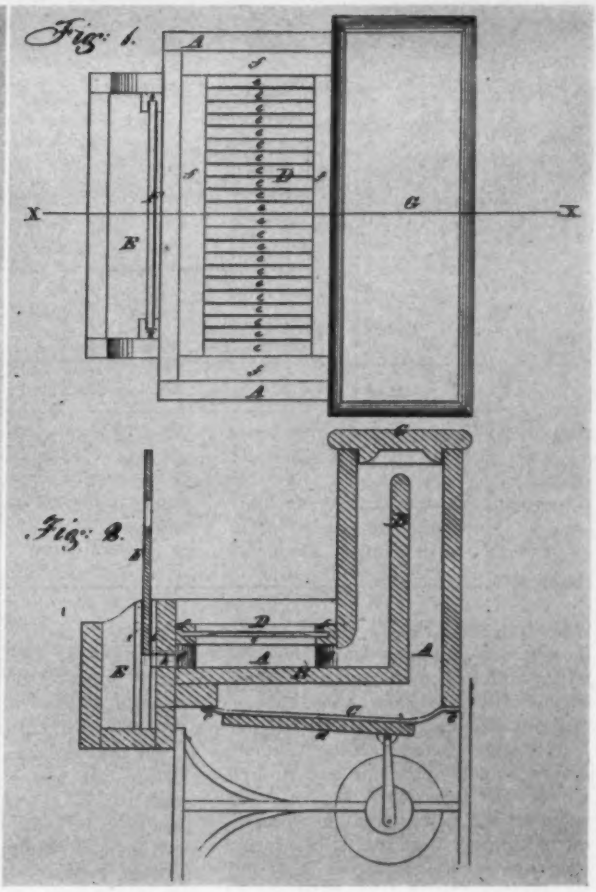



Figure 4

ferred to as "name" patents, some have a number with an X after the number; the present serial numbers began July 13, 1836, when patent No. 1 was issued.) of which we have a complete record was issued to T. Gilpin, June 25, 1830, for a calendering machine. It consisted of a smooth hollow iron roll four to eight inches in diameter with screw means for pressing the same against a paper roll. The iron roll was heated by steam and driven by a belt. It does not appear that this calender was intended to be used with a paper machine. An earlier patent for a calender was issued to W. Coolidge, April 18, 1808, entitled "Machine for Smoothing and Polishing Paper, etc."

The third restored patent was issued to L. Wooster and J. B. Holmes, August 3, 1830, and is important because it describes making paper pulp from wood. Part of the disclosure as it appears in the restored patent is as follows:

"Wood is reduced to shavings of the ordinary jack plane size, or bruised so as to be rendered to nearly the same size of the shavings. They are then placed in a cistern or boiler of sufficient dimensions and covered with water which is put to a boiling heat to each one hundred pounds of the wood (thus reduced) put from 12 to 18 pounds of alkali, either vegetable or mineral in proportion to its quality or strength if salts are used they should be reduced before they are placed on the wood in the cistern or boiler with the water they may, however, be put in with the water and wood upon reduction but the first mode is found the most preferable should lime be used there must be a sufficient quantity in all cases to equal twelve pounds of fine black salts for every one hundred pounds of wood which may be bleached upon being placed in the cistern with the wood and water or thrown in, in its pure state one hundred pounds of wood thus prepared will if attended to make from five to seven reams of paper." Lack of punctuation makes the above quotation difficult to read. In the original the difficulty is considerably greater as it was written by a poor penman in old style script.

Several years later this patent was held by the courts to be an infringement on a patent issued to William Magaw, who obtained three patents before the Wooster and Holmes patent was issued. These were: "Material for Making Paper" of March 8, 1828; "Preparing Vegetable Substances for Paper Making" of May 22, 1828; and "Making Paper from Straw, Hay, & etc." of March 8, 1830. It is not known which of these patents was involved. It doesn't seem likely that the courts of that time would have held the third to be infringed because of the different material used. Unfortunately, Weeks (1) states that straw was used in the first two patents also and with wood ashes as the pulping agent; so possibly the courts of that period interpreted a patent more broadly than the writer would have expected.

The next restored patent was issued to J. Ames, April 6, 1831, for an "improvement in the method of 'washing rags for paper making.'" The improvement consisted in "dispensing with the washers or screens now in use and substituting in their stead, a wire cloth covered cylinder" mounted on a mandrel fixed in a regular washing vat or engine. The cylinder was built up from several spiders mounted on a

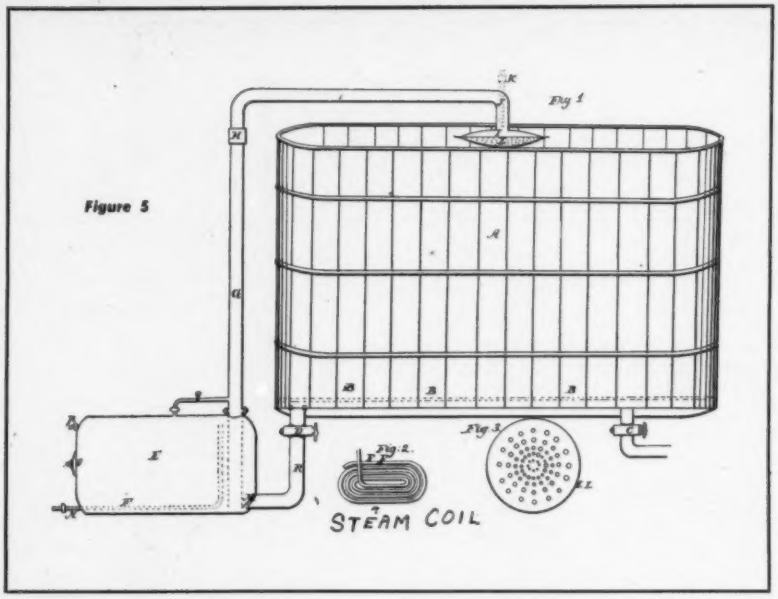



Figure 5

shaft, rods were closely spaced around these spiders and fixed thereto, a coarse screen and then a fine screen covered the rods. The cylinder was closed at one end and open at the other. It was placed in the engine with the open end covering a hole in the side wall through which the dirty water drained. The cylinder was belt driven. Dimensions of the cylinder were twenty-two inches long and twenty-two inches in diameter. This patent is of further interest because it gives an idea about the subject matter of one of the patents we know only by title. The patent states: "The wire cloth cylinder I do not claim as my invention for which I now seek a patent; it having been before patented by me." Ames was rather a prolific inventor, four other patents for this period are listed under his name. The titles and dates are as follows: "Paper Making," May 14, 1822; "Paper Sizing," September 9, 1822; "Paper Making Machine," May 14, 1832, and "Paper Machine," February 20, 1835. Apparently the third of these patents was for a cylinder mold paper machine. However, the use of the cylinder mold was known before this time as it had been invented and patented in England by Dickinson in 1809. Possibly others in this country were issued patents on cylinder molds before the Ames patent. T. Langstroth was issued a patent May 1, 1804, for a "Paper-Mill"; C. Kinsey for a "Paper Making Machine," May 8, 1807; T. Gilpin for "Making Paper by Machinery" December 24, 1816, and J. B. Pignatelli for a "Paper Making Machine" December 2, 1819. The Gilpin machine is definitely stated to have been a cylinder mold by Weeks (1).

The fourth known patent (7281X) was issued jointly to Jervis and Trench, November 6, 1832. This patent was for a "Cylinder hot or cold Press" to be used in place of the hand pressing methods then in practice.

Of the remaining patents of this period one was issued to W. Coles, January 23, 1833, for a felt washer; one to S. A. Sweet, December 31, 1833, for a pulp strainer and one to C. Forbes, February 20, 1836, for a fourdrinier type papermaking machine. The latter patent appears to have been the first patent issued for a fourdrinier machine in this country; although, the fourdrinier was invented and patented in France in 1799 by Louis Robert and later (1801) patented in England by John Gamble. The Fourdrinier Brothers, from whom the name is derived, improved on the machine and obtained an English patent in 1807. The Forbes machine consisted of an endless woven wire belt fourteen feet long looped around what is now termed a breast roll fourteen inches in diameter and a couch roll twenty inches in diameter. Eighteen or twenty table rolls one or one and a quarter inches in diameter supported the upper run of the wire which was inclined upwardly from the breast roll to the couch roll. The wire formed one end and part of the bottom of the pulp vat. Water drained by gravity through the wire leaving the pulp deposited on the wire. A small press roll was used on top of the wire before the couch roll. Robert Rose was actually the inventor of this machine. Forbes was the administrator of Rose's estate and the patent was issued in Forbes' name. The machine is illustrated in Figure 1. This drawing was made on an unknown date from the patent disclosure rather than the original drawing. It appears to be inaccurate as the patent definitely states the wire forms one end and part of the bottom of the pulp vat.

## Patent Data Classifications

No attempt was made at arranging an official classification of patents until December 19, 1830, when a list of United States patents (7) was sent to the House of Representatives grouped into 16 classes. The second of these reads: "Factory machinery: For cotton, wool, flax, hemp, paper, rolling and slitting mills, rail cutters, etc." Six thousand one hundred and seventy patents were involved in this grouping. This classification system was maintained until the patent laws were revised July 4, 1836. This revision re-established the requirement of novelty as a requirement of patentability.

Basically, the present patent laws follow very closely the revision of 1836. With the return to the concept of novelty as a basis of patentability a better system of classification was necessary and the 9,802 patents in existence were divided into 22 classes, the third of which read: Manufactures of fibrous and textile substances, including machines for preparing fibers of wool, cotton, silk, fur, paper, etc. This classification was followed until January 1, 1868, when some 80,000 patents were regrouped into 36 classes, with papermaking being recognized as a separate field of invention in class 24, (4) reading: "Papermaking: The preparation of vegetable pulp and the manufacture of paper; papier-maché, pasteboard, etc." Twenty-seven subclasses were established.

This classification system remained in effect until March 1, 1872, when the now 131,000 patents were divided into 145 classes, the ninety-second of which read: "Papermaking: Manufacture of paper, cardboard, etc., and of articles direct from pulp." Thirty-six subclasses (5) were established under the main class. The number of sub-classes was increased to 55 in 1898 and to the present 77 on May 7, 1910. About 3,000 patents were involved at this time. The class now has over 9,000 patents and reclassification is badly needed. (Counting foreign patents and cross references the number is estimated to be more than 20,000.)

The first patent concerning paper, issued under the present system, was No. 495 issued December 1, 1837, to J. Ames. This patent is to a method of tub sizing a continuous sheet of paper and as it is not classified in Class 92, it is mentioned only briefly as of interest to the main subject matter of this article.

The first patent issued which is properly classifiable in Class 92 was No. 614 issued to Isaac Sanderson on February 22, 1838. This patent covers a process for making brown paper from "'sand-grass' or 'beach-grass.'" The process comprises boiling the grass in a lime or potash solution of unmentioned concentration for about two hours. The grass is then cut into pieces two or three inches in length and then beaten in a solution of six pounds of potash and half a pint of "train-oil or spermaceti-oil." "The grass is then beaten and prepared in the usual way of preparing materials for making paper." The single claim reads: "The use of the said grass in and for making brown paper."

The number of patents concerning papermaking increased very rapidly after 1839. Eighty-eight had been issued by this time and over 800 were issued by 1884. Obviously, only a few of these can be mentioned in this article. Most of the following patents represent the first patent in the particular field it concerns. It should be borne in mind, however, that this does not necessarily mean that the patent represents the first use of the process or apparatus described. Many of the patents are for improvements on then existing processes and apparatus.

Patent No. 1,336 issued to Knight and Condit, September 25, 1839, is shown in Figure 2. This is of interest as it shows an early papermaking machine from the head box to the reels. New features include: a wood roll E for collecting "broken paper and waste pulp"; a mechanism, shown in Figure 2 of the drawing, for giving the forming cylinder a lateral shake; endless deckle bands H; and the arrangement of the drying cylinders T in pairs for heating and pressing at the same time. The use of an extra large forming cylinder and the pulp box S are mentioned as being novel but are not claimed.

Patent No. 3,349 issued to B. C. Smith, November 21, 1843, is one of the forefathers of our present day semichemical processes. The patent discloses treating the "cane-plant" to reduce it "from its natural rigid state into a pliant condition" by any one of three different treatments: (1) hydrofluoric acid followed by steeping one or two hours in "chloride of soda" or carbonate of soda; (2) boiling in a solution of a mixture of lime and soda or potash for six to eight hours; and (3) boiling or steaming at 250 Fahr. "or upward" for fifteen or twenty hours. The cane after any one of these treatments is reduced to the desired fiber size by crushing, beating, or pounding. Three such different treatments would ordinarily not be permitted in a patent under modern practice.

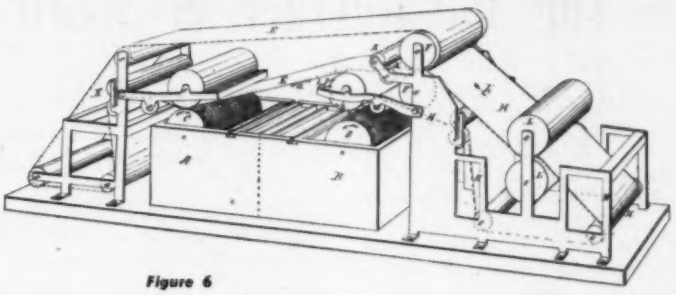


Figure 6

Patent No. 5,756 issued September 5, 1848, to G. Sweetland is shown in Figure 3. This machine was for "preparing pulp from rags, straw and other materials for making paper of every description." Many of the features of this machine are incorporated in similar machines now in use.

Patent No. 8,306 issued to G. West, August 19, 1851, is shown in Figure 4 and illustrates one of the earliest diaphragm screens. Partition B is to prevent water from contacting the leather diaphragm C. Pulp to be screened is placed above the screen D.

Patent No. 9,910 to Coupier and Mellier issued August 2, 1853 shows an early digester and is illustrated in Figure 5. The main features are liquor circulation and indirect treating. Hot water is advised for washing the pulp in the digester; bleaching is also carried out in the digester.

Patent No. 10,519 issued February 14, 1854, to S. G. Levis is to one of the first multicylinder machines. The patent drawing is shown in Figure 6 and is self-explanatory.

Patent No. 11,343 dated July 18, 1854, and issued to Ladd and Keen discloses one of the first attempts to use chlorine as a pulping agent. "Very fine shavings or cuttings, the finer the better" of wood are boiled in a solution of caustic alkali "of the strength indicated by twelve degrees of the English hydrometer" at 300 to 500 Fahr. (A temperature of 500 Fahr. is above the charring point of wood. Apparently even the early inventors were not bashful about claiming wide limits.) for an unspecified time. The shavings are then pressed and washed. They are then "exposed to the action of chlorine." This treatment is followed by another washing and a treatment with a warm dilute caustic solution. The material is then washed, bleached and treated in the usual manner. Incidentally this patent states that the liquors from both of the alkaline steps may be recovered for re-use by evaporating and burning. It also states that chlorine may be recovered from the hydrochloric acid resulting from the second step.

### Literature Citations


1) History of Paper Manufacture in the United States by Weeks, 1916, pp. 57, 58, 59, 68.

2) Papermaking Through Eighteen Centuries by Hunter, 1930.

3) Chronology of the Origin and Progress of Paper and Paper-Making by Munsell, 1876.

4) Classification of Subjects of Invention adopted in the United States Patent Office, January 1, 1868.

5) Classified Index of Subjects of Invention adopted in the United States Patent Office, March 1, 1872.

6) The Story of Paper-making, by Frank O. Butler, 1901.

7) History of Classification of Patents, by M. F. Bailey, 1946.


**This article will be continued. Part II will appear in an early issue of this magazine.**

# The Manufacture of Straw Pulp*---Part II

**S. I. ARONOVSKY****
**Northern Regional Research Laboratory†**

**Fine Pulps from Straw**

▸▸▸ STRAW AND STRAW PULP for corrugating or similar type of paper or board have been discussed in Part I of this article. A much broader field of use for straw lies in the production of pulps for fine specialty papers and boards. Such pulps and papers from straw are in commercial production and use in various parts of the world, particularly in Europe, South America, and the Orient.

A number of mills in Holland produce excellent bleached papers and boards from wheat and rye straw pulps. The formation in these papers and boards is extremely uniform, owing to the character of the relatively short but very thin straw fibers with a high ratio of fiber length to diameter (Table 5). The pulps usually prepared by the soda or kraft processes are bleached readily to a high degree of brightness. The English turned to straw during the war, through necessity, and produced good grades of many types of paper from straw pulp prepared in their esparto and wood pulp mills. At the present time, Great Britain is giving serious consideration to the establishment of a permanent straw pulp industry and to building suitable pulp mills for this purpose. Italy has been producing bleached paper from straw by the Pomilio process. The same process is used in Argentina, where one of the mills produces about 100 tons per day of bleached wheat straw pulp. The Argentine pulp is used for various types of paper including the better grades of bond, writing, book, ledger, and the like. Beautiful, bright, strong, bleached papers with excellent formation are manufactured in Java from rice straw pulp prepared by an essentially alkaline process. Many other countries use straw and other agricultural residue pulps for the production of fine specialty papers and paper products.

The United States, however, with probably the largest annual crop of straws and other residues in the world, wastes these materials, except for a relatively small tonnage used for corrugating paper. Many factors have contributed toward developing this situation here, the more important ones being: the abundant supply of suitable pulpwoods available at low cost; the relatively high handling costs in collecting, baling, and storing the straws and other agricultural residues; the generally lower cellulose contents of the residues as compared to woods; and the lack of a concerted research program to determine the suitability of these agricultural residue fibers for various types of specialty papers. As a result, straw and other fibrous residues had not been considered seriously in this country as suitable raw materials for the production of fine paper.

The recent war with its tremendous expenditure of raw materials and accompanying economic changes has affected adversely the pulp and paper industry as well as the other large industries in the United States. The pulpwood situation is well known, having been greatly publicized in the lay as well as in the technical press; the supply of pulpwood is very short, its cost is high and still rising, and importations from other countries are far smaller than expected. A recent Department of Commerce report on pulp and paper (*25*) stated, "Concern regarding future supplies of pulpwood for mills in the Lake States districts, especially Minnesota, Wisconsin, and Michigan, has been accentuated by the recent announcement of the Prime Minister of the Ontario province that exports of pulpwood to the United States would be progressively discontinued over a period of 10 years."

The supply of straw and of other agricultural residues is, on the other hand, practically inexhaustible. It is renewed annually as long as grain and other foods are grown on the farm. With the advances described earlier in this discussion, it is expected that the price of straw in the mill yard will be reduced below the present inflated cost through decreased manual handling and decreased losses of fiber from excessive weathering and microbial attack. It is obvious, therefore, that a point must be reached where the abundant, low-cost straw can compete with pulpwood as raw material for paper, on an equal economic basis. The economic meeting of these raw materials is not too distant, and the possibilities of straw for fine pulp and paper are becoming increasingly attractive to the industry.

Development of the modern technology of pulp and paper manufacture has been centered, as stated previously, almost entirely on wood as the raw material. While a rather voluminous literature has been accumulated on the production of pulp and paper from agricultural residues, a survey of this literature leads to the conclusion that the previous approach to this problem, namely, the production of cheap substitutes from farm residues, was unsound technologically and economically.

Some of the more important technological reasons for the failure of farm residues to make much headway in pulp and paper production in this country may be: (a) infrequent and scattered attacks on the problem, mainly in periods of shortage of other papermaking materials; (b) failure to consider the fundamental physical and chemical properties of the residue ma-

(*) Presented as one of the Shartle Lecture Series, Middletown, Ohio, March 18, 1948.
(**) In charge, Pulp and Paper Section, Agricultural Residues Division.
(†) Located at Peoria, Illinois; one of the laboratories of the Bureau of Agricultural and Industrial Chemistry, Agricultural Research Administration, U. S. Department of Agriculture.

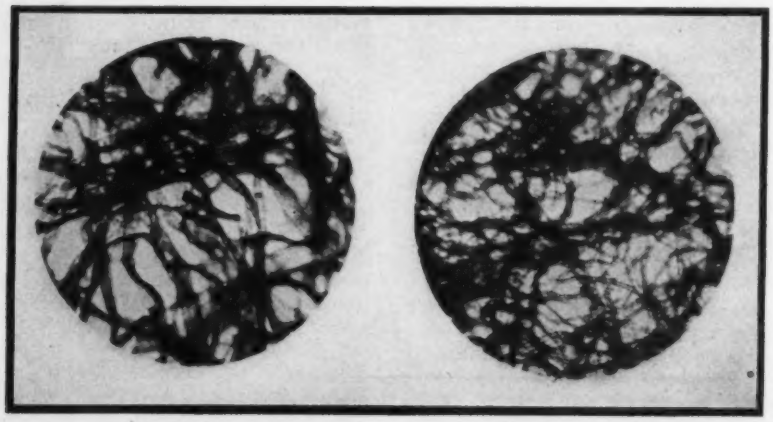


*Fig. 11—(left) Coniferous wood alpha pulp x 200 magnification; (right) mixture of 60 per cent coniferous wood alpha pulp and 40 per cent barley straw alpha pulp x 200 magnification. (Note the greatly decreased pore size due to the addition of the thin-fibered pulp.)*

terials; and (c) the attempt to use existing wood pulping processes and equipment without suitable modification. It appeared, therefore, that a new method of attack would be necessary for a successful solution of this problem.

### Straw Pulping at the Northern Laboratory

After considerable thought it was decided at this Laboratory that the best and soundest approach would be to determine the properties and characteristics of the various agricultural residues and the fundamental differences among themselves and between them and other papermaking materials. Then, by capitalizing on the particular properties of these residues it might be possible to establish their rightful place in industry on a utilitarian and economic basis. Several examples of commercial enterprises in the pulp and paper field may be cited wherein success resulted from recognition and utilization of the specific properties of the agricultural residue materials involved. The excellent formation, strength, opacity, and printability of lightweight esparto book and Bible paper is largely due to the very narrow diameter and ease of hydration, without fibrillation, of the esparto fiber. The high pentosan content and the consequently relative ease of hydration of wheat straw pulp makes it an outstanding material for the production of stiff corrugating paper. The rigid specifications of cigarette paper are best met by the strong bast fiber of flax straw. The long, tough springy fiber bundles of bagasse produce a superior insulating board of low density and high strength and ruggedness. These examples indicate the soundness of the stated plan of attack. This approach to the problem obtained the complete approval of a large number of mill operators and technical men with whom these ideas were discussed.

The first work in this program arose with the war emergency. It was anticipated that the thin, cereal straw pulp fibers might be suitable for use in gas mask filters. Such filters produced from a blend of coniferous wood alpha pulp with either barley straw or rice straw alpha pulp were superior to those produced with wood pulps alone, in that the retention of smoke and fume particles by the filter pad could be increased without decreasing its permeability to air (*26, 27*). This result was due to the reduction in size of the openings in any one plane in the filter pad, by bridging the relatively large openings between the thick wood fibers with the very thin straw fibers (Figure 11). At the same time, the thickness of the pad could be reduced since the long tortuous paths needed to entrap the smoke or fume particles with wood pulp alone were no longer required. This is another illustration of the applicability of the properties of agricultural residue fibers to perform a function not so easily attained with other plant fibers.

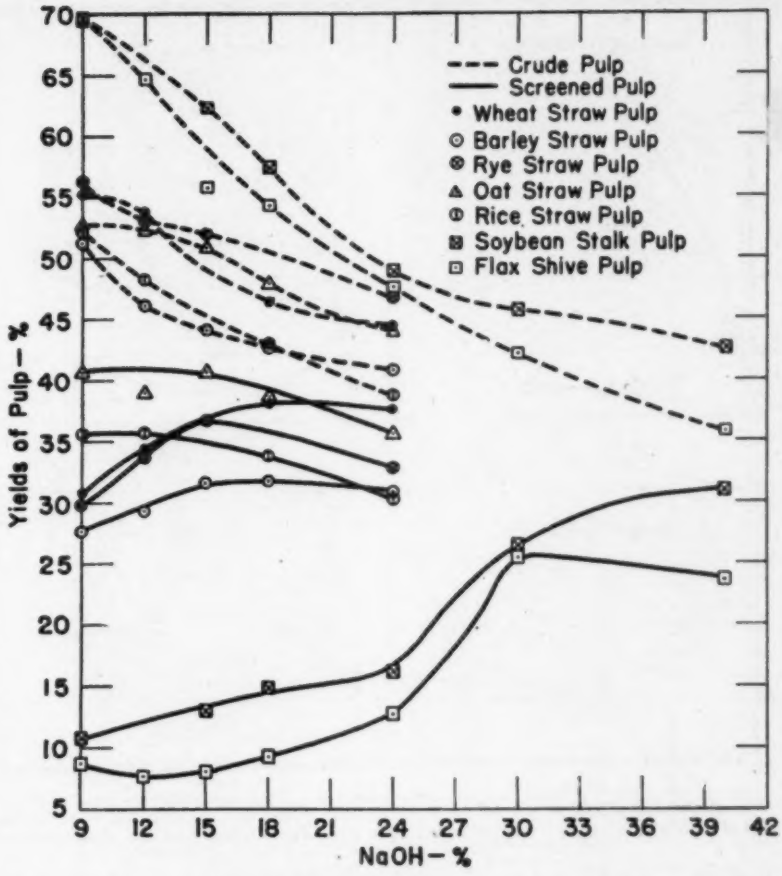



*Fig. 12—Yields of crude and screened pulps from agricultural residues cooked with varying amounts of caustic soda*

In connection with the work on gas mask filters, studies were made on soda pulps prepared from wheat, rye, oats, barley, and rice straws, and seed flax shives and soybean stalks (*28*). The yields of crude and screened pulp, shown by the curves in Figure 12, again illustrate the differences, discussed in connection with straw pulps for corrugating, between the straw-type and woody-type residue fibers. Chemical analyses and bleaching studies on these pulps showed that there were fairly definite relationships between their lignin contents, permanganate numbers and chlorine requirements for bleaching to a definite brightness (70 per cent, Hunter Reflectometer).

In order to determine the value of an improved or new pulp or paper

**Table 5.—Dimensions of Fibers from Various Plants and Woods**

| Source of fiber | Length | | | Diameter | | | Ratio— |
|---|---|---|---|---|---|---|---|
| | Maximum μ | Minimum μ | Average μ | Maximum μ | Minimum μ | Average μ | Av. length/diameter |
| Wheat, barley, oats, rye straws (23) | 3,120 | 680 | 1,480 | 24 | 7 | 13.3 | 111:1 |
| Rice straw (23) | 3,480 | 650 | 1,450 | 14 | 5 | 8.5 | 170:1 |
| Esparto grass (23) | 1,600 | 510 | 1,100 | 14 | 7 | 9.2 | 120:1 |
| Bamboo (23) | 4,350 | 1,450 | 2,700 | 27 | 7 | 14.0 | 192:1 |
| Sugarcane bagasse (23) | 2,800 | 800 | 1,700 | 34 | 10 | 20.0 | 85:1 |
| Cornstalks (23) | 2,900 | 500 | 1,500 | 24 | 14 | 18.1 | 84:1 |
| Jack pine wood (24) | — | — | 3,000 | — | — | 40 | 75:1 |
| Red spruce wood (24) | — | — | 2,700 | — | — | 32 | 85.1 |
| Aspen wood (24) | — | — | 1,000 | — | — | 26 | 38:1 |
| Red gum wood (24) | — | — | 1,600 | — | — | 32 | 50:1 |

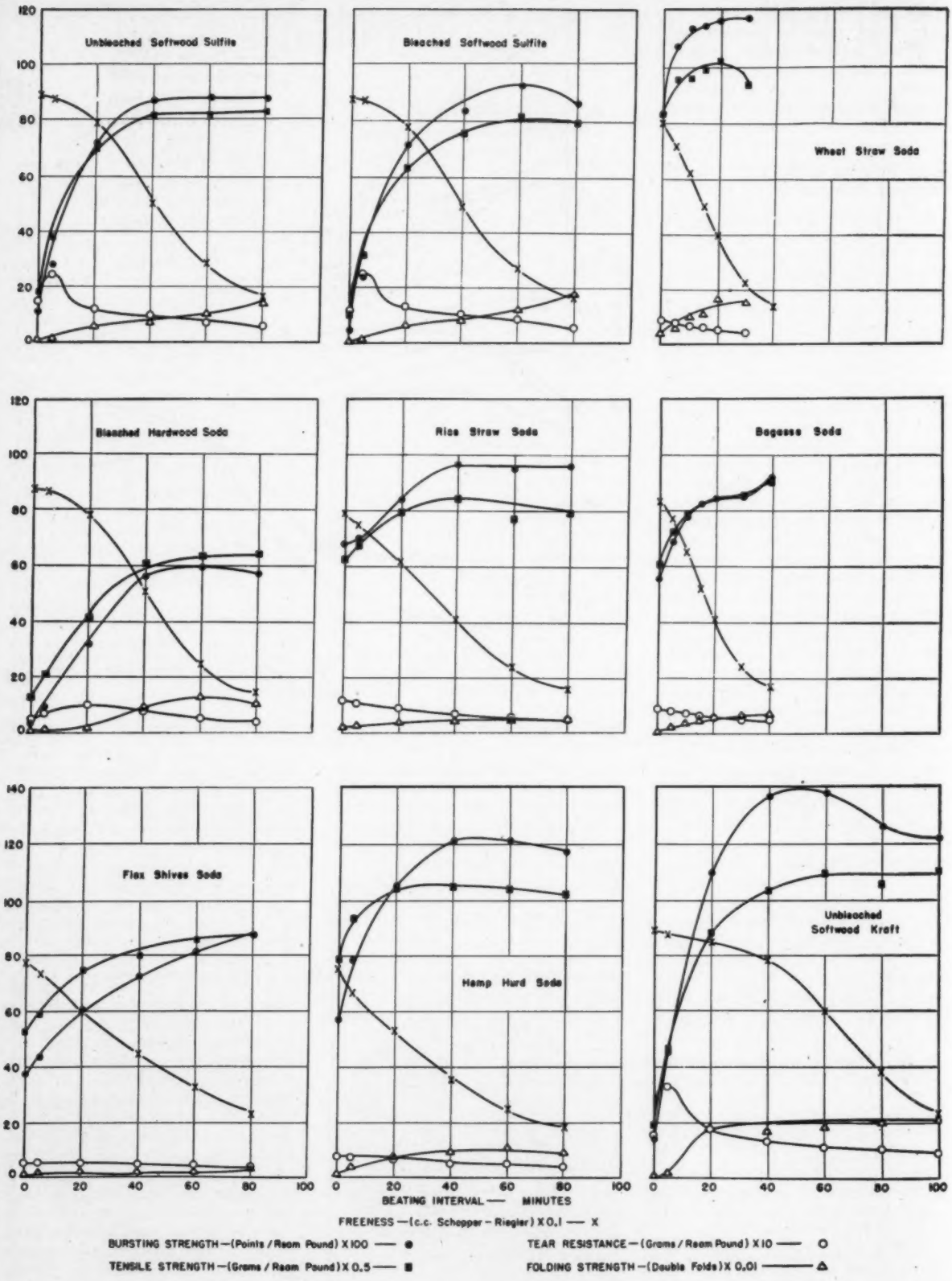

Unbleached Softwood Sulfite
Bleached Softwood Sulfite
Wheat Straw Soda
Bleached Hardwood Soda
Rice Straw Soda
Bagasse Soda
Flax Shives Soda
Hemp Hurd Soda
Unbleached Softwood Kraft
BEATING INTERVAL — MINUTES
FREENESS — (c.c. Schopper - Riegler) X 0.1 — X
BURSTING STRENGTH — (Points / Ream Pound) X 100 — ●
TEAR RESISTANCE — (Grams / Ream Pound) X 10 — ○
TENSILE STRENGTH — (Grams / Ream Pound) X 0.5 — ■
FOLDING STRENGTH — (Double Folds) X 0.01 — △

*Fig. 13—Beating and strength characteristics of wood and agricultural residue pulps. Standard sharp beater*

product it must be compared with similar products currently in use. Calibration of the approved modern pulp evaluation equipment assembled at this Laboratory in terms of several "standard" types of widely-used commercial wood pulps (standard in the sense that they meet certain minimum specifications) was therefore undertaken as one of the first steps in this plan of attack.

Experimental soda pulps from several agricultural residues were submitted to the same treatment in identical laboratory equipment, using TAPPI standard methods. The results, illustrated by the curves in Figure 13, show that the wheat straw soda pulp compared favorably with the commercial softwood sulphite pulp in all of the strength characteristics except tear resistance (*29*). The straw pulp was distinctly superior to the bleached hardwood soda in all respects.

It is interesting to note from these curves that the rate of hydration, as indicated by the rate of drop in freeness and by the time required to reach the maximum bursting strength, was considerably higher for wheat straw pulp than for the wood pulps or for some of the other residue pulps. This is probably due, in large part, to the higher hemicellulose content of the wheat straw pulp, as shown in Table 6. Comparison of the curves in Figure 13 with the values in Table 6 indicates that the wheat straw and bagasse pulps which had the highest hemicellulose content also hydrated the most rapidly.

The action of the beater on the physical structures of wood and straw pulp fibers is illustrated in the photomicrographs of Figure 14. It may be seen that the wood sulphite pulp was strongly fibrillated while the wheat straw soda pulp was swollen and bruised to some extent but hardly fibrillated at all, when both pulps were beaten to 400 ml. Schopper-Riegler in the same equipment. This difference in degree of fibrillation probably accounts to a large extent for the uniform formation obtained in straw paper and for the tendency of long wood fibers to give "wild" formation.

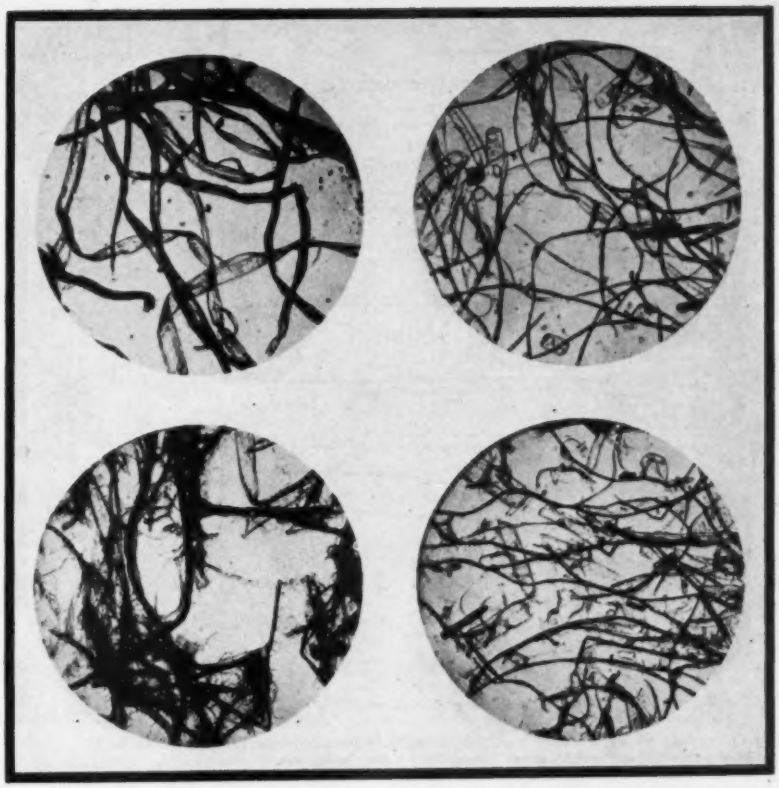


*Fig. 14—Comparative effects of beating on wood and straw pulps. Upper left—Unbeaten western sulphite wood pulp. Lower left—Same pulp beaten in 50 minutes to a freeness of 400 ml. Schopper-Riegler. Upper right—Wheat straw soda pulp unbeaten. Lower right—Same pulp beaten in 20 minutes to a freeness of 400 ml. Schopper-Riegler*

## Processes for Pulping Straw

The next step in the program on agricultural residue pulping was the evaluation of various pulping methods to determine their adaptability to these residues. Wheat straw was chosen as the raw material for this work for several reasons: it is the most abundant residue available; its economical collection has been worked out most completely; and it appeared to be more suitable than the other residues from the standpoint of low chemical requirements for pulping, and freedom from large amounts of pith material. The straw was subjected, under essentially identical conditions, to the soda, kraft, ammonia, neutral sulphite, magnesium bisulphite, and ammonium bisulphite pulping processes. The pulps were screened, bleached, analyzed chemically, and tested for strength characteristics.

The results (*30*) showed that pulping with ammonia was impractical on account of the large amounts of reagent required. The acid pulping processes produced relatively weak and brittle pulps from straw. Acid pulping methods are apparently unsuitable for agricultural residues that have high ash and silica contents. The highest pulp yields were obtained with the neutral sulphite process, as shown in Figure 15, and the kraft process gave somewhat higher yields than the soda process. The soda pulps were the strongest, followed closely by the kraft, and then by the neutral sulphite pulps. Bleaching resulted in a lower loss of fiber from neutral sulphite pulp than from the kraft or soda pulp (Figure 16). Bleaching also enhanced the strength properties, with the exception of tensile strength. The largest strength increase on bleaching was evidenced by the neutral sulphite pulp.

Since the cellulose content of straw,

**Table 6—Pentosans, Lignin, and Ash in Wood and in Agricultural Residue Pulps**

| Pulp | Cook No. | In Pulp[a] | | |
|---|---|---|---|---|
| | | Pentosans | Lignin | Ash |
| | | Per cent | Per cent | Per cent |
| Unbleached wood sulphite | Commercial | 4.0 | 2.2 | 0.4 |
| Bleached wood sulphite | Commercial | 3.9 | — | 0.3 |
| Bleached hardwood soda | Commercial | 17.6 | — | 1.0 |
| Unbleached wood kraft | Commercial | 10.0 | 3.4 | 0.8 |
| Bagasse soda | 202-204 | 24.8 | 2.8 | 0.9 |
| Flax shive soda | 206, 207, 209, 210 | 14.2 | 6.0 | 3.2 |
| Hemp hurd soda | 212-214 | 14.1 | 1.6 | 2.8 |
| Rice straw soda | 199-201 | 21.2 | 3.0 | 14.0 |
| Wheat straw soda | 184-187 | 26.5 | 4.5 | 2.8 |

[a]Basis moisture-free pulp.

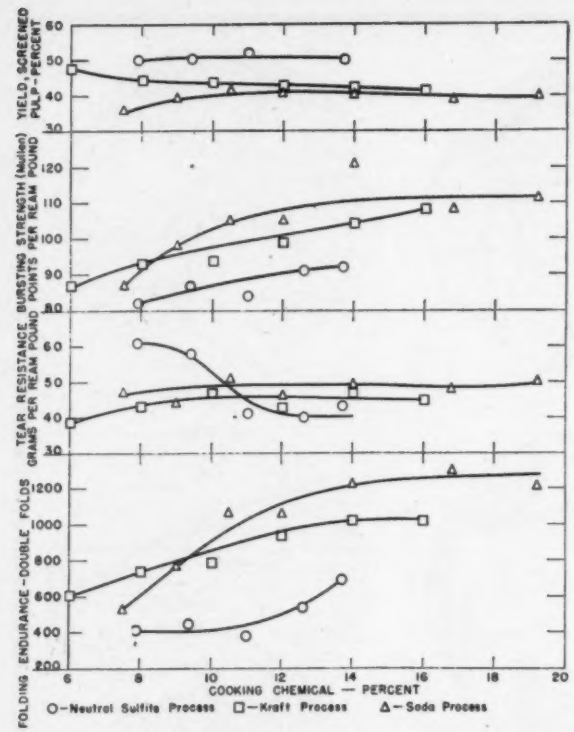

YIELD, SCREENED PULP - PERCENT
TEAR RESISTANCE BURSTING STRENGTH (Mullen) GRAMS PER REAM POUND POINTS PER REAM POUND
FOLDING ENDURANCE - DOUBLE FOLDS
COOKING CHEMICAL — PERCENT
O—Neutral Sulfite Process □—Kraft Process Δ—Soda Process

*Fig. 15.—Pulp yields and the bursting strength, tear resistance and folding endurance of straw pulps prepared by the soda, kraft, and neutral sulphite processes*

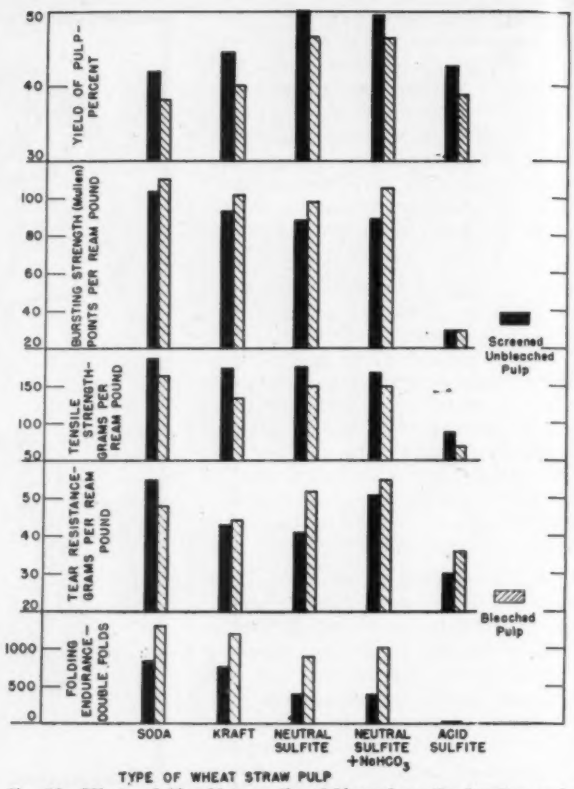



*Fig. 16—Effects of bleaching on the yields and on the bursting and tensile strength, tear resistance, and folding endurance of straw pulps produced by different pulping processes*

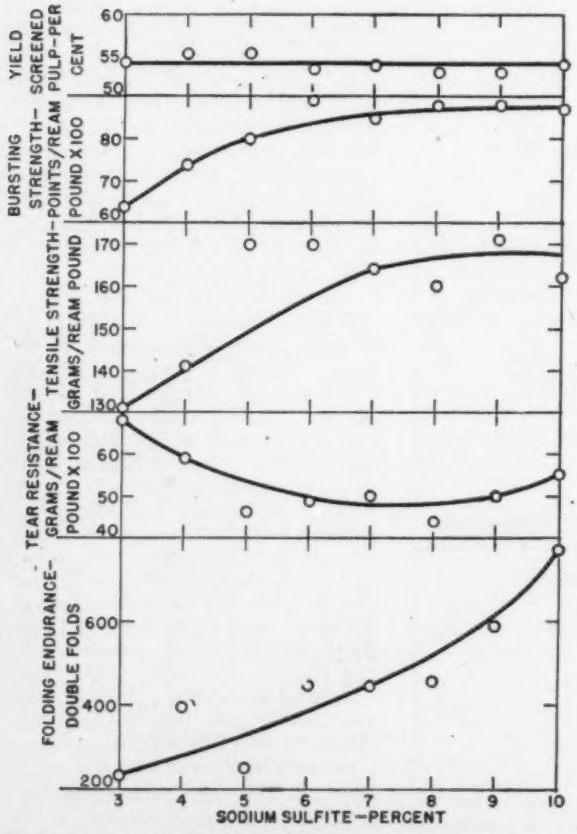



*Fig. 17—Effect of increasing sodium sulphite on the yields and strength properties of neutral sulphite wheat straw pulps*

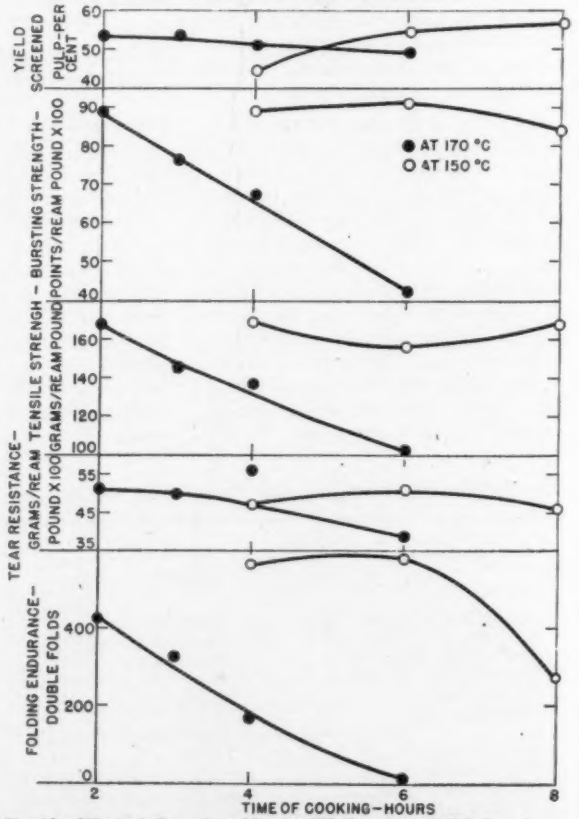



*Fig. 18—Effect of time of cooking at 170 deg. C. and 150 deg. C. on the yields and strength properties of neutral sulphite wheat straw pulps*

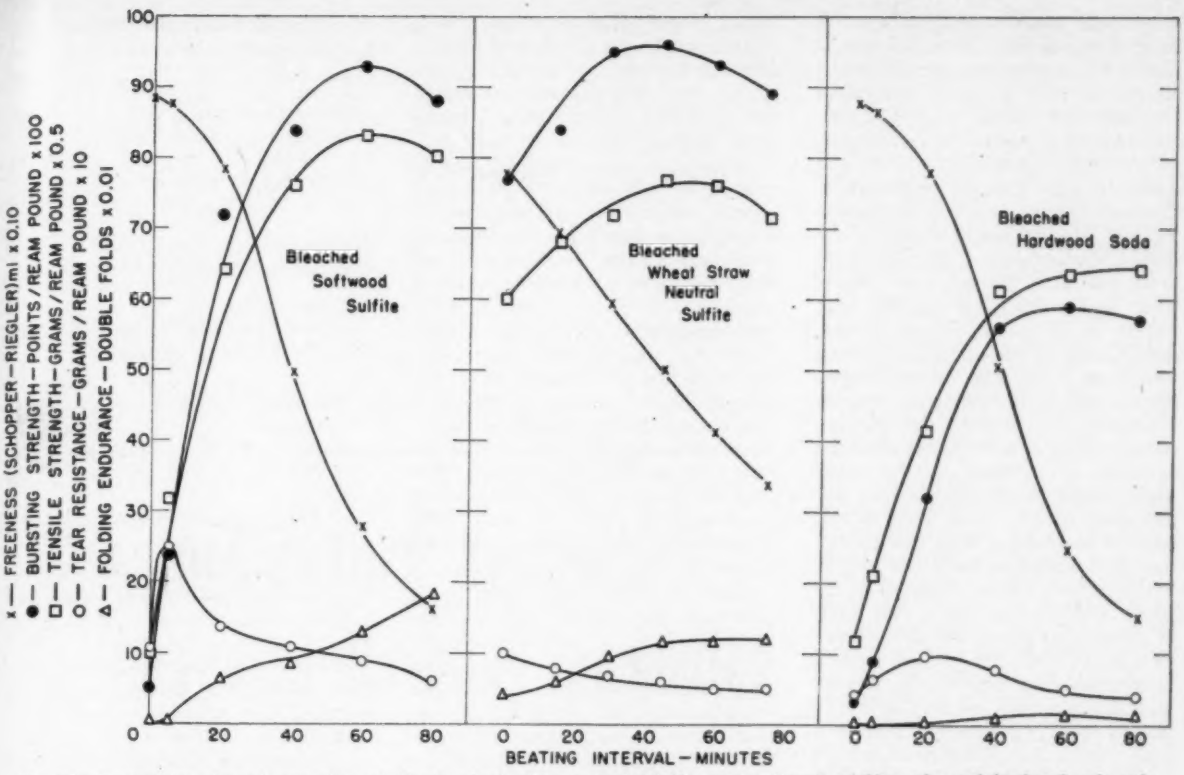

x — FREENESS (SCHOPPER—RIEGLER) ml x 0.10
● — BURSTING STRENGTH—POINTS/REAM POUND x 100
□ — TENSILE STRENGTH—GRAMS/REAM POUND x 0.5
○ — TEAR RESISTANCE—GRAMS/REAM POUND x 10
△ — FOLDING ENDURANCE—DOUBLE FOLDS x 0.01
Bleached Softwood Sulfite
Bleached Wheat Straw Neutral Sulfite
Bleached Hardwood Soda
BEATING INTERVAL—MINUTES

*Fig. 19—Comparative strength properties of bleach wheat straw neutral sulphite pulp, softwood sulphite pulp, and hardwood soda pulp*

and of most of the other fibrous agricultural residues, is lower than that of most woods, one way to make straw pulp competitive with wood pulp would be to use a pulping process which produces extra high yields. It was noted in previous work that the holocellulose (*31*) of wheat straw is approximately equal to that found in wood; whereas the straw contains less alpha-cellulose, it has a larger amount of hemicelluloses, mainly pentosans, than is generally found in wood. However, the use, on a commercial scale, of the chemicals and steps required in the quantitative laboratory preparation of holocellulose appeared quite impractical. Many pulping experiments were tried, including chlorination in various organic solvents, the use of chlorites both alone and in combination with other pulping and bleaching agents, and chlorination in aqueous media under pressure (*32*). While apparently satisfactory pulps, based on yield and chemical analysis, were produced by some of these methods, the procedures did not seem to be feasible from a practical and economic viewpoint.

Efforts were then directed toward a more detailed study of the neutral sulphite process on wheat straw, using various chemical concentrations and different cooking times and temperatures. The yield of screened pulp (8-cut) varied but little when the sodium sulphite was increased from 3 to 10 per cent of the dry straw (Figure 17). The optimum strength properties were obtained with approximately 7 to 8 per cent sodium sulphite and 3 per cent sodium carbonate. With all the other pulping conditions held constant, increasing the time of cooking from 2 to 6 hours at 170 C. gave somewhat reduced yields of pulp with progressively poorer strength properties as shown in Figure 18. This may be correlated with decreasing *p*H of the spent liquors; if these spent liquors have *p*H values below 6.0, the pulps are generally weaker. Approximately similar results were obtained when the straw was cooked for 8 hours at 150 deg., for 4 hours at 160 deg., or for 2 hours at 170 deg. This indicates that pulping with sodium sulphite approximates a chemical reaction of the first order in which the reaction velocity doubles for each 10 deg. rise in temperature (centigrade).

The optimum conditions for producing wheat straw pulp were found to be 8 per cent sodium sulphite plus 2 to 3 per cent sodium carbonate (on the basis of dry straw), a total liquid to straw ratio of 7:1, and cooking for 2 hours at 170 C. Yields of 52 to 55 per cent of screened pulp with the following strength characteristics, at maximum Mullen, were obtained under these conditions: bursting strength 85 to 95 points, tensile strength 170 grams per ream pound, freeness (Schopper-Riegler) 400 to 500 ml., and tear resistance 40 to 60 grams per ream pound. This pulp could be bleached to a brightness of 70 with 5 to 7 per cent of total chlorine, to give 49 to 53 per cent of bleached pulp, based on the original dry straw. The strength properties of the pulp, particularly bursting strength and folding endurance, were improved on bleaching, and the bleached pulp hydrated more rapidly than before bleaching. A comparison of this bleached pulp with bleached softwood sulphite and hardwood soda pulps, shown in Figure 19, indicated the complete superiority of the straw pulp over the hardwood product and its favorable position with respect to softwood sulphite pulp (*33*).

## General Considerations

The promising application of the neutral sulphite process to straw, as described in the present paper, is the result of a concerted effort in accordance with the program developed in the Northern Laboratory on the industrial utilization of agricultural residues. While this process development is not to be considered as completed, the data obtained are sufficiently promising and interesting to merit serious consideration of neutral sulphite straw pulp for fine specialty papers by the pulp and paper industry.

No attempt is made to suggest that the neutral sulphite straw pulp is an

all-purpose product suitable by itself for any kind of paper. Rather, this pulp should be used as one ingredient in a blend, to which this pulp contributes properties not so easily or so well provided by other pulps. The easy-bleachability, high hemicellulose content, and relatively high strength properties of this pulp suggest a number of types of paper to which it would contribute desirable characteristics. The relatively short but very narrow straw fibers, when used in sufficient quantity with respect to the other fibers present, should result in considerably improved formation in writing, tablet, ledger, mimeo, and similar noncoated papers. It should also improve the printing characteristics of such papers since the hydrated straw fibers in the paper would tend to reduce surface fuzz. For the same reason, straw pulp should improve the coating surface of papers, such as magazine or book, and thereby result in more uniform coating of the paper. Well-hydrated straw pulp tends to form tinny paper; the inclusion of such pulp should improve the stiffness of normally limp papers, such as filled magazine and book, as well as that of art and drawing papers. Excellent book paper was made from a furnish containing about 10 to 15 per cent straw soda pulp in an Ohio mill a number of years ago. This furnish had excellent running characteristics on the paper machine. Many other types of papers would no doubt benefit from the addition of straw pulp to the furnish.

Different types of fibers should generally not be mixed and then processed together if the optimum characteristics of each type of fiber are to be brought out in the final paper. It is no more correct or desirable to subject a mixture of different fibers to the same type of processing than it is to try to pulp wood and straw together in the same digester. Pulps should be processed and refined separately to develop the desired characteristics of each pulp to its optimum, and then they should be blended and mixed thoroughly before reaching the paper machine. This procedure is particularly desirable when agricultural residue pulps are to be blended with wood pulp or other papermaking pulps. The straw pulp hydrates more easily because of its high hemicellulose content. Preliminary experiments under way at the Peoria Laboratory indicate that blending of more or less beaten straw pulp with unbeaten or only slightly beaten softwood sulphite pulp produces papers which retain the desirable optimum characteristics of both types of fibers.

The pulping and pulp mill equipment required to produce neutral sulphite wheat straw pulp is practically the same as that used for the alkaline pulping of wood. This has already been demonstrated on a commercial scale in Holland. Shortly after the war a commission of Dutch papermakers visited the Northern Laboratory to discuss straw pulping, and the essential steps of the neutral sulphite pulping process was outlined to them. Within three months after they had returned to Holland they were producing regularly about 100 tons per week of bleached neutral sulphite straw pulp, in a mill which had until then been used for making inferior acid sulphite straw pulp. According to their report (*34*), the yields and properties of their commercial neutral sulphite pulp, made with the available pulp mill equipment, were essentially the same as those obtained by the Peoria Laboratory. The bleached pulp is used in Holland by itself and in admixture with other papermaking fibers for the production of fine specialty papers and board.

Some straw papers produced in the past have had relatively high dirt and speck contents. It is recognized that the presence of excessive dirt in straw paper would be a serious disadvantage. Modern collection and baling practice with combine straw, however, should produce a raw material with considerably lower chaff and dirt content. Chopping the straw and dusting the chopped material, as practiced successfully on dirty esparto grass in England and on straw in Europe and South America, will result in a further reduction of dirt. Blowing the digester charge and screening the pulp should practically eliminate the specks due to node material. Finally, the Vortrap, Dirtec, or similar equipment used successfully in cleaning up wood pulp, should work equally well with straw pulp. The commercial production of clean esparto paper in England and clean straw paper in Holland and in South America shows that, with proper handling, clean paper can be made commercially from straw and similar fibrous materials in the United States.

## Estimated Cost of Fine Straw Pulp

The exact cost of producing the neutral sulphite wheat straw pulp is not available at this time, since no large-scale manufacture of this pulp exists in this country. However, a rough calculation may be obtained from the raw material costs, using December, 1947, prices. The figures are based on a yield of 50 per cent of bleached pulp, obtained with the use of 8 per cent sodium sulphite plus 2.5 per cent sodium carbonate (based on oven-dry straw) for pulping, and 7 per cent total chlorine (based on oven-dry screened, unbleached pulp) for bleaching:

Raw material costs for producing 1 ton of air-dry bleached straw pulp:

| | |
|---|---|
| Straw—4,000 lb. at $14.00 per ton | $28.00 |
| Cooking chemicals | |
| $Na_2SO_3$—288 lb. at $2.60 per cwt. | 7.49 |
| $Na_2CO_3$—90 lb. at $1.80 per cwt. | 1.62 |
| Unbleached, screened pulp—2,120 lb. (53 per cent yield) | |
| Bleaching chemicals | |
| $Cl_2$—161 lb. at $2.55 per cwt. | 4.11 |
| CaO—42 lb. at $10.00 per ton | .21 |
| $Na_2SO_3$—11 lb. at $2.60 per cwt. | .29 |
| $Na_2CO_3$—11 lb. at $1.80 per cwt. | .20 |
| Total cost raw materials | $41.92 |

Multiplying the raw material cost by two to estimate the approximate cost of the manufactured product gives $83.84 as the manufactured cost of 1 ton of air-dry bleached wheat straw pulp produced by the sodium sulphite process. This figure is not very high, considering the present market price of $125 per ton for bleached hardwood soda pulp and the higher prices obtained for softwood pulps. It is expected that the figure of $14 per ton for straw will be reduced considerably as soon as sufficient equipment for economic collection and baling of straw is available. This will also establish the straw supplies closer to the mill and reduce the cost of transportation. Since the cost of straw represents two-thirds of the total cost of the raw materials in the above calculation, a reduction in the price of straw will materially lower the cost of the pulp.

## Summary and Conclusions

This discussion has shown the practical possibilities of producing straw pulps for use in various types of papers and boards. The essential raw material, straw, is produced annually in abundant supply, and there is no possibility of a scarcity of straw in the foreseeable future. The development of technical control and process improvement in the manufacture of straw pulp for strawboard has been described. Data have been presented to show the technological and economic feasibility of producing high yields of strong, easy-bleaching straw pulps for the manufacture of fine papers. The next logical step in this development is the making of a mill-scale trial run to determine the optimum conditions for preparing and handling the straw pulp on a production basis. The Northern Laboratory will help in every way possible in making such trial runs.

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This article by Dr. Aronovsky has been published in two parts. Part I appeared in the April issue of this magazine.

# Condensate Return System Increases Machine Production


**F. T. CLEVELAND**
**Norristown Magnesia and Asbestos Company**


▶▶▶ THE PAPER MILL OF the Norristown Magnesia & Asbestos Co. (Norristown, Pa.) produces about 75 tons of asbestos paper and insulation specialties per twenty-four hours. This production is made on two cylinder paper machines. One paper machine is equipped with 24 dryers, each with a face width of 42 inches; the other, with 25 dryers, each with a face width of 78 inches.

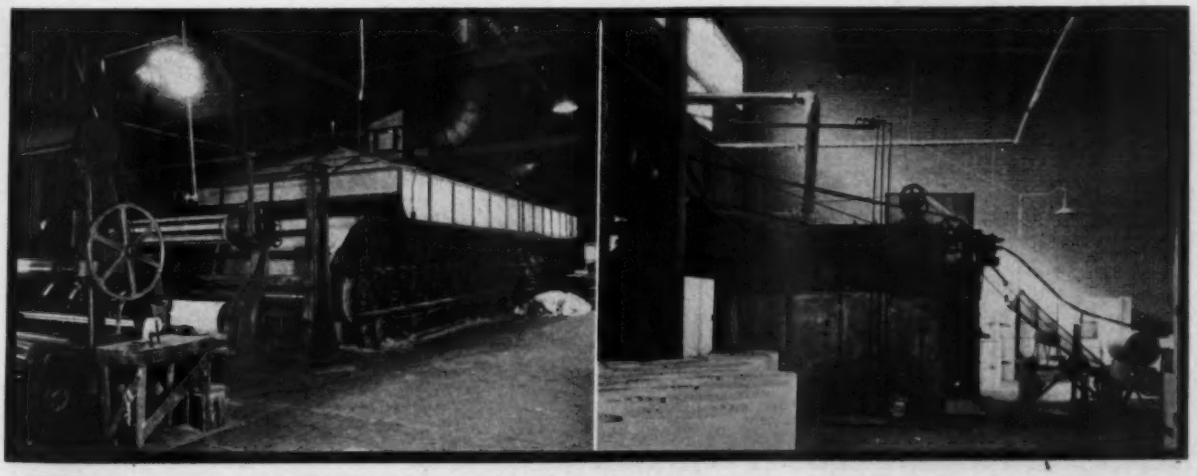
The production of 75 tons per day from these two machines has resulted from the installation of a closed high pressure condensate return system (Cochrane C-B System) to serve the dryer sections of both machines. In fact, the installation of this equipment has permitted a speeding up of production over former practice of about 17½ per cent.

In the previous dryer drainage system used on the two machines, air and condensate collected in the dryers because of intermittent drainage. The present system with its turbulent steam flow eliminates the air and the condensate. The result is a uniformly high steam temperature within the dryers and a higher heat transfer rate through the dryer shells.

With such operating conditions on the dryers, the routine drying capacity of the machines is improved. At the same time, they permit faster starting up after a shutdown for a week end or similarly long period of time. Formerly, two to three hours were required to heat the dryers at such a time to get them ready for a start up; now only ten or fifteen minutes are needed.

The condensate from all except the first three dryers on the wet end of each machine drains to a flash tank. The flash steam thus produced is used to heat the first three dryers of each machine. These dryers, in turn, drain to the suction of the high pressure condensate return system and thus establishes its operating pressure at about 22 psi. The flash tank itself, operating at a higher pressure, also is drained to the same line.

Since the installation of this system the temperature of the drying cylinder



*LEFT—Drying rolls of 78-inch paper machine . . . RIGHT—Cabinet dryer for corrugated paper is heated by steam coils with fans circulating hot air*

*LEFT—Hard board is built up on a revolving drum, then cut and stacked on perforated racks (foreground), and hard dried in coil-heated cabinet . . . RIGHT—Installation of the 15-hp. high pressure condensate return system*

has been increased about 10 deg. Fahr. Also, machine speeds have been increased from 85 fpm to 100 fpm.

Ordinary feed pumps are not capable of handling the mixture of entrained air and hot condensate in the flash tanks. The condensate at close to vaporization temperature tends to flash on the suction side and bind the pump.

In the high pressure condensate return system a specially designed centrifugal pump draws water from the thermo-fin priming loop and discharges it as a high velocity jet through the jet pump nozzle. This jet strikes the returned hot condensate and induces condensate flow through the Venturi-shaped mixing tube and into the thermo-fin priming loop. The additional volume of condensate introduced into the constantly filled loop results in the discharge of an equal volume of condensate through the air separator to the deaerating heater.

The hot condensate and entrained air are drawn rapidly and positively from the heating coils and drums by the jet pump. Air is eliminated from the circuit by passing through the air separator and the condensate is returned at maximum temperature and pressure. Thus the circuit is completed in a closed system without substantial drop in temperature. Performance of the unit is verified by the pressure gauge on the inlet together with the pressure gauge and thermometer on the outlet.

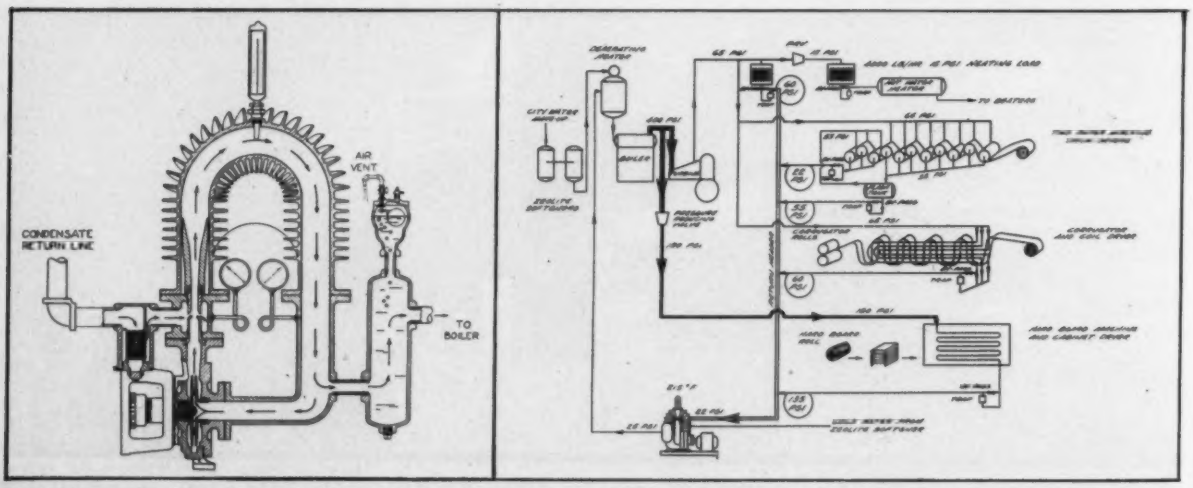
Sixty-five pound steam is used for heating and drying cylinders. It is obtained as bleed steam from a turbine that operates on steam generated at 400 psi by a 23,000 lb. per hour boiler.

Steam also at 65 pounds pressure is used in the coils of a continuous dryer for corrugated asbestos paper. In this operation, fans circulate the heat as the corrugated asbestos paper passes through the chamber.

Asbestos pulp also is built up on a revolving drum for the purpose of making heavy hard board. As the specified thickness of asbestos around the drum is reached, the covering is slit and removed for placement on flat racks in a cabinet dryer operating at 150 psi reduced from 400 psi boiler pressure. Condensate from the coils of this cabinet dryer is returned to the high pressure condensate system in the common return line.

Part of the plant heating load also is obtained from 65 psi steam. The condensate from this steam as well as that from the papermaking machinery is returned to a deaerating heater at 25 psi by the high pressure condensate return system.

The remainder of the 4,000 lb. per hour plant heating load is obtained from 15 psi steam, and the condensate is used to heat water for the beaters. This part of the heating load is not handled by the high pressure condensate return system.




*LEFT—Diagram showing condensate flow through Cochrane C-B System . . . RIGHT—Heat balance diagram showing condensate flow to return system*

# CHECK VALVES . . .

## *Traffic Cops of the Pipe Lines - Part 2*

**H. J. BARTLETT**
**Manager, Alloy Sales, Crane Co.**

▸▸▸ FUNDAMENTAL RULES must be followed in installing check valves if proper service is to be received by the user. Since check valves have no external moving parts which indicate direction of movement of the discs, it is relatively easy to install them backwards if care is not used.

**Installation of Check Valves**

The basic rule covering the installation of all check valves is that they must be applied so that the force of gravity tends to close the valve. The only exception to this rule is the case of the high-pressure vertical-type ball check valves which may be used in the horizontal position. Following this rule through, it will be seen that swing check valves can be used in horizontal lines and also for upward flow in any line inclined at any angle up to 90 degrees from the horizontal. Lift check valves of the globe type, on the other hand, should only be used in horizontal lines. Play in the guides of the ordinary type of globe check valves is sufficient to cause improper seating of the disc if the movement of the disc is varied from a vertical line.

Swing check valves, regardless of the angle of the pipe line in which they are used, should always be installed with the hinge pins in a horizontal position. This insures that the disc will always swing in a vertical plane. There is sufficient play in the component parts of the hinge-disc assembly in swing checks to render imperfect seating likely if the valve is canted over to one side when installed.

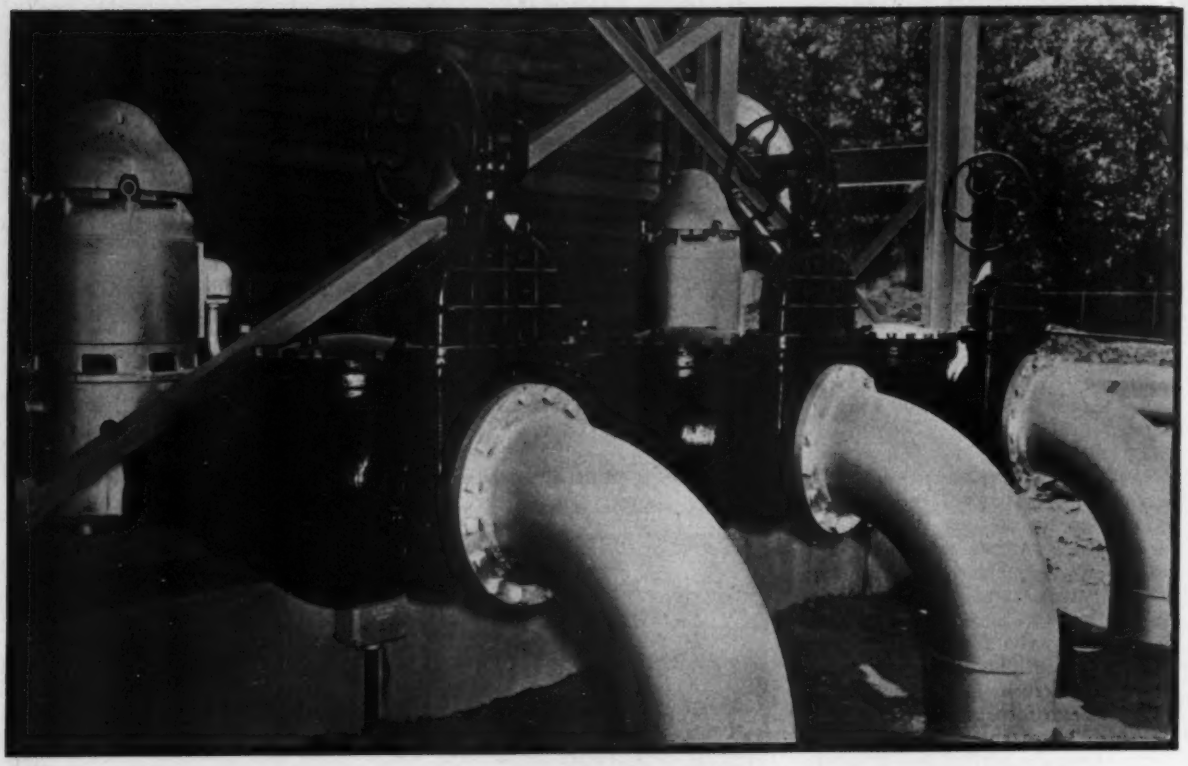
The same remarks as far as alignment is concerned apply to lift check valves. They should always be applied to a pipe line in such a way that the movement of the discs is in a vertical plane. This is particularly true of lift check valves with metal discs, for here beveled seating surfaces are used which require that the discs be brought to the seats without canting or cocking if tight seating is expected.

### Two Rules to Consider

Two very broad rules have been in quite general use for many years to cover the use of swing and lift check valves. The first is, "When gate valves are required in a line, use swing check valves with them. When globe valves are used, use lift checks." The other is, "On liquid service, use swing check valves. On steam, air, gas or general vapor service, use lift checks." There is considerable merit in both of these rules, although it is immediately evident that there is some conflict between them and there are quite a few exceptions to both.

It is obvious, of course, that the first rule is not very definite, for there is no general rule covering the usage of either gate or globe valves, and so we frequently find them used indiscriminately on steam, air, oil, water and gas. In a general sense, however, it is true that gate valves predominate for liquid service, because liquids flow under low head pressures, or power is expended to pump them, and velocities are usually quite low. As a conse-

*Crane No. 35, 200-pound brass swing check valve with regrindable disc on by-pass line for oil pressure to incising machine elevator*



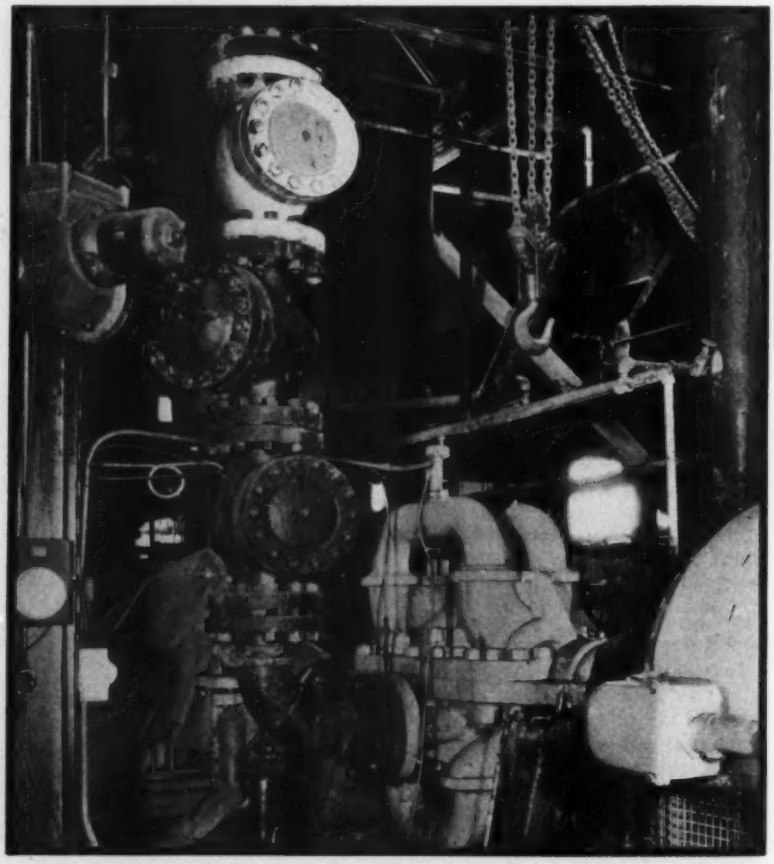
*Lines to water circulating pumps at cooling tower of natural gas booster station showing Crane standard iron body swing check valves*

quence, losses due to friction are important and extra precautions are taken to insure minimum resistance. For such service, gate valves have a definite advantage, and swing check valves fall into the same category, for their resistance to flow is much less than that of lift check valves. Furthermore, since the velocities are low in liquid lines, the destructive effect of "slamming" is greatly reduced.

Some notable exceptions can be made to the rule that swing checks should be used on liquid lines. For example, when there are severe pulsations in flow such as caused by reciprocating pumps, it is desirable to use cushioned check valves. No swing check can be adequately cushioned, hence it is necessary to recommend lift check valves of the proper design. Again, in the handling of volatile liquids or those which are notably hard to hold, difficulty will likely be had with swing check valves, for they are not as tight as lift check valves, and not as easy to keep in good condition.

## Swing Check Valves

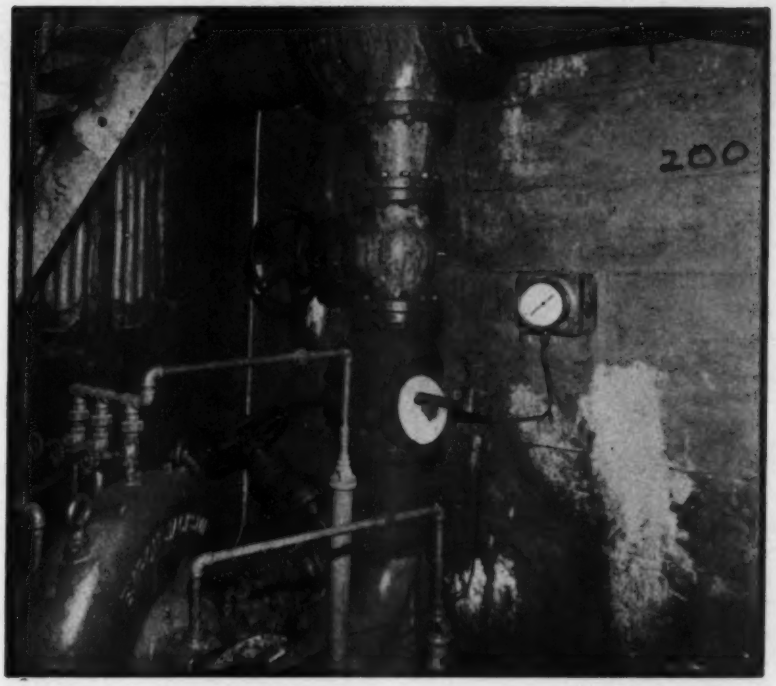
Disregarding exceptions, it can be assumed that the greatest field of usefulness for swing check valves is in



*Crane No. 187X, 900-pound cast steel swing check valves above and below Crane motor-operated gate valve on high pressure side of pump in hydraulic wood barking plant*

water and other liquid service. Considering very briefly the six sub groups of swing checks, the following comments can be made.

Check valves with the integral disc-hinge construction can be used on hot or cold water service and on steam at very low pressures, as in heating systems. Their use should be avoided where severe wear on the seating surfaces may take place, because of the difficulty of making repairs. They should never be used on rapidly pulsating flow.




*Mine pumping installation showing Crane No. 39E check valve with lever and weight*

Check valves of the regrinding type can be used on hot or cold water and on other fluids not corrosive to iron or brass. Like all swing check valves, they should not be used on pulsating flow. For steam service at all save low pressures, lift checks are preferred.

Leather disc valves are recommended specifically for cold water service, especially when foreign matter is present.

Angle swing check valves are space and material savers, and where direction of flow is suitable can be used for the same conditions as regular swing check valves.

Foot valves for cold water or other cold liquids should be of the leather disc type, providing such other liquids are not destructive to leather. Where centrifugal pumps discharging against high head pressures are used, it is preferable to use a leather-disc swing check valve in place of a regular foot valve.

## Lift Check Valves

Lift check valves are definitely considered to be superior to swing check valves for service on steam, air, gas, and vapors in general. The deciding factors which influence choice in this case are that gases are usually much harder to hold than liquids and the velocities used are much higher. No shop difficulties are experienced in making lift check valves tight on such service, but swing checks offer a much more serious problem. Regrinding type swing checks can be made to pass an air test in the shop after special lapping, but a few operations usually cause them to leak again. Attention has already been directed to the fact that the slamming of the disc in a swing check valve at both extremes of its movement is highly destructive, and this action is intensified as velocities in steam, air, and vapor lines are at least twenty times as great as in liquid lines. Knowing that even in liquid lines swing checks sometimes pound themselves to pieces, it is easy to imagine what happens to them when the velocities are so enormously increased.

Summarizing general service recommendations for all lift check valves, the following comment can be made.

All metal disc lift check valves of the globe, angle, and vertical types are suitable for use on steam, air, gas, and general vapor service, providing there are no severe pulsations in flow. Valves for air and gas should be specially ground and tested. All of these valves may be used on hot or cold liquid service, provided low resistance to flow is not a major objective.

Composition - disc lift check valves may be used on the same classes of service as metal-disc valves and with the same limitation as far as pulsations are concerned. For low-pressure air service, valves with soft discs are better than any metal disc valves. For extremely low air or vapor pressures, soft disc valves with a spring above the disc to aid in closing and maintaining tight seating surfaces, should be recommended. Air service in general is hard on check valves and it is advisable, therefore, to use sturdy valves. On liquids which are hard to hold, composition-disc valves with suitable discs will stay tight longer than metal-disc valves.

Ball-type lift check valves are frequently used on services where gummy deposits are liable to form on guides and seats to such an extent that the ordinary type of valve might not operate properly.

Cushioned - type lift check valves should be used on steam, air, gas, and all liquid service where severe pulsations in flow are present.

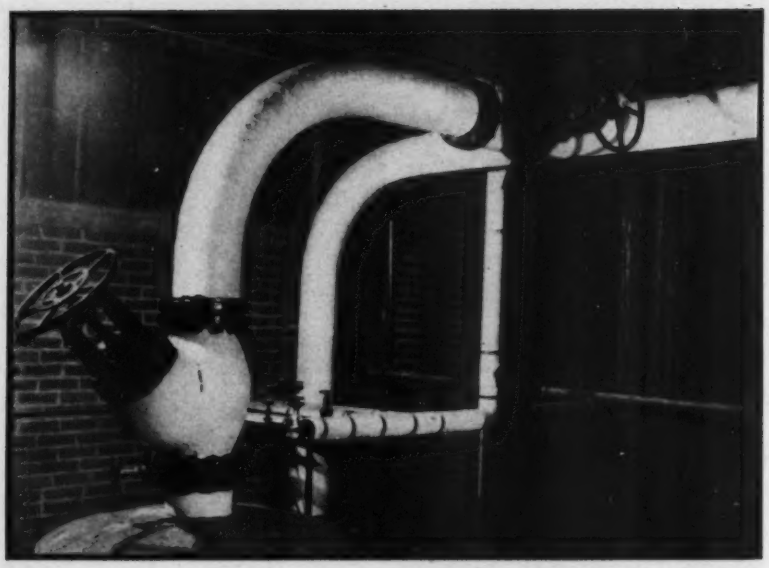
## Some Specific Applications

So far, the discussion of the application of check valves has been quite general. However, there are a number of quite common installations which are subject to more than the usual amount of grief, and the detailed discussion of some of them may clarify the statement previously made that service conditions should be the governing factors in the selection of check valves.

### Air Compressor Installations

Take, for instance, the case of the average air - compressor installation. Here we have a reciprocating compressor running at speeds anywhere from 200 to 500 rpm. Most such installations operate at pressures from 60 to 120 lb. psi. If the air storage tank is large enough, pulsations in the lines leading from the tank to the air-consuming apparatus are not usually severe and, if check valves are required, any good lift check should be satisfactory. If, however, the tank is too small, pulsations may be carried through into the discharge lines from the tank, in which case only cushioned check valves should be used.

Air-compressor storage tanks should be properly drained with an automatic trap, or oil from the compressor may be carried over into the discharge lines from the tank. This in turn is liable to cause disintegration of any rubber discs used in either globe or check valves.



*Crane stop-check valve on boiler lead in a woodworking plant*

The principal difficulty in an installation of this kind comes from the check valve used between the compressor and the tank. The number of impulses in this line is proportionate to the speed of the compressor, and the tank serves only to smooth out pulsations in the lines leading from it. Any ordinary check valve will soon have its operating parts reduced to a handful of scrap metal if installed between compressor and tank. Attempts to improve the performance of such valves by installing springs between discs and caps invariably fail because the compressed air is very hot and springs soon deteriorate and break. The only sound solution to this problem is to use a cushioned check valve of the best possible design, and to install it as far from the compressor as possible.

### Centrifugal Pump Service

Going to another extreme of service, we have the case of check valves installed on the discharge side of centrifugal pumps operating against high heads. This is a common installation encountered frequently in water works service, in fire protection work, in mine pumping, and in general wherever water must be discharged to overhead tanks or elevated reservoirs. Centrifugal pumps deliver water with an absence of pulsations so that swing check valves are well adapted for this service. However, when high heads are involved there is great danger of tremendous shock pressures being built up in the line when the pump shuts down and the check valve closes.

The extent of this shock pressure is far greater than normal maximum pressure in the line and is frequently great enough to fracture fittings, valves or other equipment not having inherently high shock resistance.

Study developed that the shock pressures were built up because the flow in the line reversed itself when the pump shut down, and this reversed flow assumed considerable proportions before the discharge check valve at the pump closed. The closing of the valve with reversed flow already set up under a high head was sufficient to cause a tremendous shock throughout the line. From this point on, the solution was simple. It was merely necessary to use a check valve which would close immediately when the pump stopped and before reversal of flow could start. This was accomplished very simply by equipping the ordinary swing check valve with an outside lever and weight in such a way that the weight aided in closing the disc.

In actual service, such a valve will close when the pump stops, slightly before forward motion of the water ceases, and thus there is no reversal of flow at all.

### Stop-Check Valves

Of all the check valves so far discussed, probably only the stop-check has been given wide publicity through advertising and sales literature. These valves were designed specifically for one important service, namely in steam lines between boilers and headers, although it has already been pointed out that they perform admirably in many other locations in piping systems. Boiler lead service is so important, however, that particular attention should be given to them for that class of work. To start with, an automatic stop-check valve should be installed in the pipe line from each boiler to the main steam header, when more than one boiler is connected to the same header.

When so used, the valve performs several important functions: It acts as an automatic nonreturn and "safety first" valve, preventing a back flow of steam from the header into the boiler in the event of a failure or shutdown of the boiler. It acts as a manually operated stop-valve which may be closed when it is necessary to cut a boiler out of service temporarily without drawing the fire. A gate valve is usually installed at the header so that the line may be shut down when it is necessary to work on the stop-check valve. It automatically cuts the boiler into service when pressure has been built up to a point slightly above the header pressure, and conversely prevents it from going into service if it is not steaming properly.

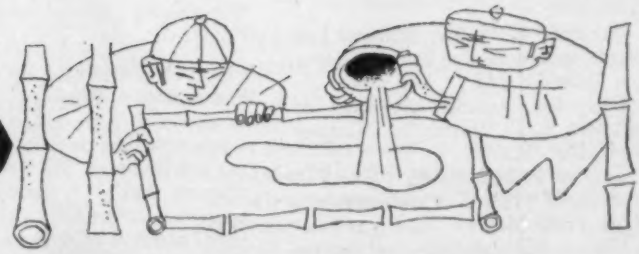
Part II concludes this article. The first part was published in the April issue of this magazine.

# Paper SKETCHES

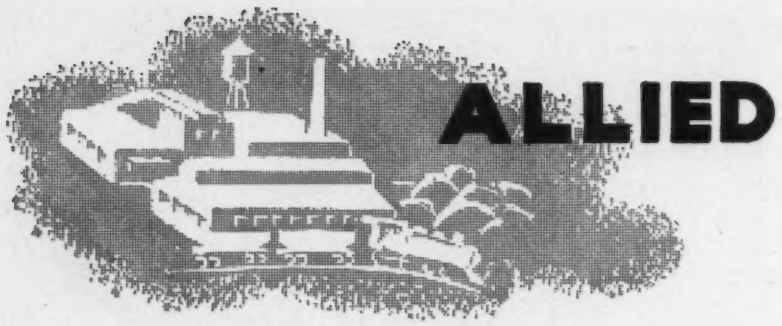
WHEN MARCHANT WARRELL OPERATED ENGLAND'S FIRST PRACTICAL FOURDRINIER AT TWO WATERS, HERTFORDSHIRE, IN 1812, BOTTLES OF VITRIOL WERE KEPT ON THE MILL'S ROOF TO POUR UPON RIOTING MAKERS OF HAND-MADE PAPER, SHOULD THEY TRY TO DAMAGE THE MACHINE.

GUSTAVUS ADOLPHUS, FAMED SWEDISH GENERAL OF THE 1600's, IS SAID TO HAVE BEEN THE FIRST TO USE PAPER CARTRIDGES.

*Earliest* METHOD OF MAKING PAPER WAS TO POUR LIQUID PULP INTO WOVEN CLOTH, BAMBOO-FRAMED MOLDS—AND LET THE PULP DRY IN THE MOLD ITSELF.



TO AID THE "NEW LOOK" A MORE PROFESSIONAL-LOOKING HOME STEAM-PRESSING JOB IS NOW POSSIBLE WITH A NEW TYPE OF PARCHMENT PAPER. IT BECOMES TRANSPARENT WHEN MOISTENED, HAS THE PRESSING QUALITIES OF CLOTH, AND CAN BE DISPOSED OF AFTER USE.




## BOLTON PRIZE WINNING ESSAYS IN BOOK FORM

The prize winning essays in The Third Bolton Award 1947-1948 have just been published in book form. The subject selected for this contest, "My Plan for Improving the Safety Record in the Pulp and Paper Industry," brought highly-gratifying results. The large number of papers submitted and the ideas written into them prove that management and workers are genuinely interested in accident prevention and are giving it a great deal of study.

Following is a list of the thirteen prize winners in the rank of presentation:

Ted Perry, mill superintendent, Kimberly-Clark Corp., Niagara Falls, N.Y.

E. A. Page, personnel superintendent, Kimberly-Clark Corp., Lakeview Mill, Neenah, Wis.

C. L. R. Dougherty, assistant manager industrial relations division, Union Bag & Paper Corp., Savannah, Ga.

George W. Harper, director of safety, The Mead Corp., Chillicothe, Ohio.

George W. Holland, editor *EMBA News,* International Paper Co., Hudson River Mill, Palmer, N.Y.

Charles A. Howard, safety director, West Virginia Pulp & Paper Co., Charleston, S.C.

Frederick W. Judge, manager boxboard production, The Bartgis Brothers Co., Ilchester, Md.

Edward L. Lincoln, personnel department, S. D. Warren Co., Cumberland Mills, Maine.

Thomas P. McDonnell, editor *T & H Bulletin,* Tileston & Hollingsworth, Hyde Park, Mass.

Gordon Morseth, pulp mill superintendent, Detroit Sulphite Pulp & Paper Co., Detroit, Mich.

Fred R. Sievers, groundwood mill superintendent, Crown Zellerbach Corp., Camas, Wash.

Richard L. Talbot, Kimberly-Clark Corp., Oshkosh, Wis.

Supplementing the above list is a paper entitled "Accident Prevention Plan," by A. E. H. Fair, president, Alliance Paper Mills, Ltd. Mr. Fair's plan has been in operation for a number of years in a large Canadian mill. Because of its results, the plan has been adapted to other mills with great success.

The Bolton Contest, which is conducted annually, is conducted under the auspices of the American Pulp and Paper Mill Superintendents Association.

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## BRISTOL OPENS SERIES OF INSTRUMENT COURSES

The Bristol Company (Waterbury, Conn.) is conducting a series of courses for plant instrument and operating men in the Theory and Application of Industrial Instruments. Each course consists of two weeks of intensive lectures and laboratory work, with special emphasis on instrument maintenance and repair. Subjects covered include instruments for pressure, temperature, relative humidity, flow, pH and electrical measurements; pyrometry; pneumatic, electric and electronic control systems, and telemetering.

The courses are open to men interested in the application, servicing, and repair of instruments in all types of manufacturing plants, and are under the direction of F. A. Faust, Education Department, The Bristol Company, Waterbury 91, Connecticut.

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▶▶▶ THE PROPOSAL to change the name of the American Rolling Mill Company to Armco Steel Corporation was accepted at the annual meeting of the stockholders. The change became effective April 17. Shareholders also approved authorizing 3,500,000 additional shares of common stock.

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## BAUSCH & LOMB CONSTRUCTS UNDERGROUND LABORATORY

A unique underground laboratory is now being built by Bausch & Lomb Company, Rochester, Minnesota, 10¾ feet below ground level on solid rock. Vibration-proof and designed to control temperatures to within one hundreth of a degree, the laboratory will house engines used to rule diffraction gratings.

Side walls, made of layers of four-inch brick, waterproofing, insulating material and 14-inch steel reinforced concrete, will be 21 inches thick. The floor measures 13 inches in thickness, and will have a special vibration-absorbing covering. The roof, designed to support a 250-ton covering of earth which will provide the required insulation, will be 18 inches thick.

Pits three feet wide, seven feet long, and two feet deep are provided for the installation of massive supports for each ruling engineer. Air conditioning equipment will maintain a temperature within the laboratory constant to better than one tenth of a degree Fahrenheit, and in the inner rooms, to within one hundreth of a degree while the engines are actually ruling gratings.

▼

## TOURS OF HERCULES LABS ORGANIZED FOR STUDENT CHEMISTS AND ENGINEERS

Hercules Powder Company has inaugurated a series of tours of several of its plants and laboratories for student chemists, chemical engineers and their professors. The tours include the Hercules Experiment Station near Wilmington, Delaware; the Hopewell, Virginia, cellulose products and chemical cotton plants; and the naval stores plant at Brunswick, Georgia.

Dr. Emil Ott, Hercules director of research, and other members of the research staff, arranged the visits as a means of promoting better understanding between university and industrial research men. The trips provide an opportunity for the university groups to see how research is integrated with chemical production.

So far, students from Massachusetts Institute of Technology and the University of Illinois have visited the plants. Students are selected by faculty and chemical engineering department heads on the basis of their interests and ability to profit from the trip.

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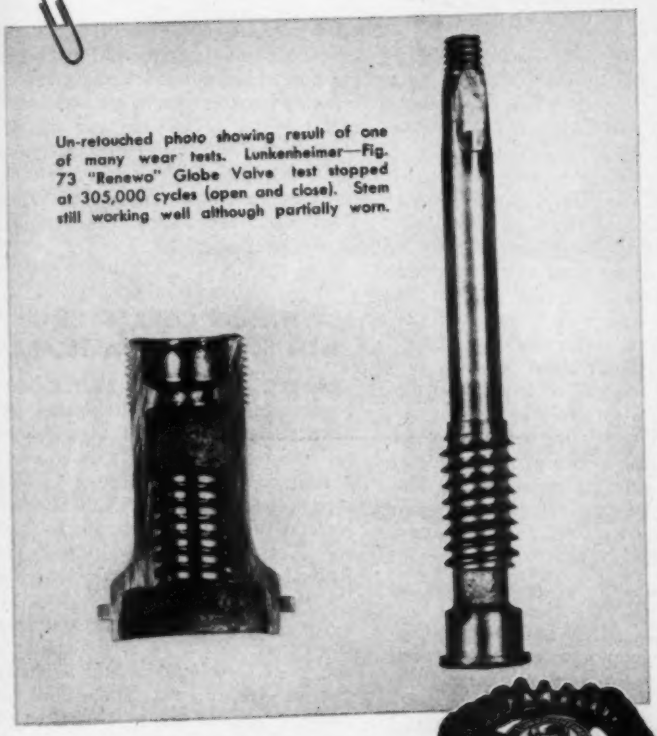
## EXPERIMENTAL STATION OF DU PONT TO BE EXPANDED

A $30,000,000 expansion of research facilities at the Du Pont Company's Experimental Station at Wilmington, Delaware, has been approved by the executive and finance committees and submitted for ratification to the board of directors. This is the biggest single laboratory project the company has ever undertaken and will make the station one of the largest research establishments in the world.

# PROVED ...in actual service



Un-retouched photo showing result of one of many wear tests. Lunkenheimer—Fig. 73 "Renewo" Globe Valve test stopped at 305,000 cycles (open and close). Stem still working well although partially worn.

**MILLIONS OF LUNKENHEIMER VALVES IN SERVICE . . . WITHOUT A SINGLE REPORT OF STEM-THREAD FAILURE.**

● For many years, stem-thread wear was a major source of valve failures. Corrosion and especially dezincification, also frequently caused failures. With traditional resourcefulness, LUNKENHEIMER research developed two new stem alloys (Symbols RSB and Alloy 6) which completely revolutionized all prior conceptions of stem serviceability (patent granted).

● Before submitting this revolutionary development to the trade, laboratory tests of valves under severe operating conditions were conducted with these and many other possible materials. In every test by wide margins, LUNKENHEIMER alloy stems outlasted others.

● Today, out of millions of LUNKENHEIMER Valves equipped with these exclusive alloy stems, not one has been returned because of stem-thread failures. Serviceability in other respects has had comparable improvement.

YOUR LUNKENHEIMER DISTRIBUTOR will gladly explain in detail the many advantages of this patented and exclusive stem material. Ask him about LUNKENHEIMER Alloy Bronze Valve Stems.

Fig. 73 "Renewo" Globe Valve. All Lunkenheimer bronze stems, from the smallest to the largest, are made of patented wear-resistant alloy.

**What does this mean to you, as a valve user? By eliminating one cause of valve trouble, LUNKENHEIMER assures you far greater service life with even less maintenance cost.**

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The solution of fuel problems is an important factor in the package that is known as SENECA Service. Another item that goes into this package of SENECA Service is Dependability and today when industry needs a dependable source of supply for coal, industry is relying more and more upon SENECA and SENECA is ever striving to fulfill its obligation of leadership.

A call will bring you Prompt and Efficient SENECA Service.

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Some of the company's research organizations now located elsewhere will be transferred to the new facilities to be provided here. This major addition to scientific facilities will be an important factor in a program to increase Du Pont's activities in fundamental, long-range research as well as research directed toward the development of new chemical products and processes.

When the expansion is completed, the company expects to have 900 technical employees engaged exclusively in research work at the station, of which 200 will be transferred from other laboratory locations. The total of all employees there, technical and non-technical, will approximate 2,500.

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## HAROLD WELLS SELLS PULP MILL TO CHARLTON CO.

Harold Wells (American Paper Machinery & Engineering Works) has sold his pulp mill which is located at two miles east of Glens Falls, New York, to the F. M. Charlton Company of New York City, a large bookbinding concern. The plant will be operated under the name of the Manhattan Pulp and Paper Company, Inc.

Capacity of the plant will be stepped up to 50 tons of air dry pulp in 24 hours. The mill will be operated 24 hours a day, 6 days a week, and eventually will employ about 50 men.

The mill, of which George DeLano is superintendent, will engage in deinking and reclaiming of wastepaper and converting it into wet pulp laps to be used mostly for facial tissues. The company plans an extensive program of expansion with a bleaching process to be installed.

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▶▶▶ TWO ADDRESS CHANGES have been announced for sales offices of the Whiting Corporation, Harvey, Illinois. The Chicago district sales office will be located in the First National Bank Building, 33 South Clark Street, Chicago 3, Illinois, and the Pittsburgh district sales office will be in the Empire Building, 505 Liberty Avenue, Pittsburgh 22, Pennsylvania.

▼

## BROWN INSTRUMENT CO. ANNOUNCES EXPANSION

A $2,500,000 expansion program, announced by Brown Instrument Company, Philadelphia, will add more than 60 per cent to its present manufacturing space and a proportionate increase in employment.

The program includes construction of a four-story addition to the main plant. Building will start this month and the first phase of the project is scheduled for completion next March. When completed, the first four-story structure will enable the company to combine some of its outlying leased sites and simultaneously provide needed space and production facilities to keep pace with the present high levels of business.

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▶▶▶ THE FIRST ISSUE of a new publication was recently distributed by Micro Switch, a division of First Industrial Corporation, Freeport, Illinois. Under the name *Micro Tips*, the bulletin is intended to be an idea exchange about snap-action switches for plant engineers, electricians, and maintenance men.

▼

▶▶▶ ALL CHIPPER KNIVES made by Heppenstall Company, Pittsburgh, are now being painted Kelly green to expedite identification by pulp and fiber mill personnel. The company also recently noted the twentieth anniversary of its installation of electric induction furnaces for the production of ingots from which the alloy steel chipper knives are made.

▼

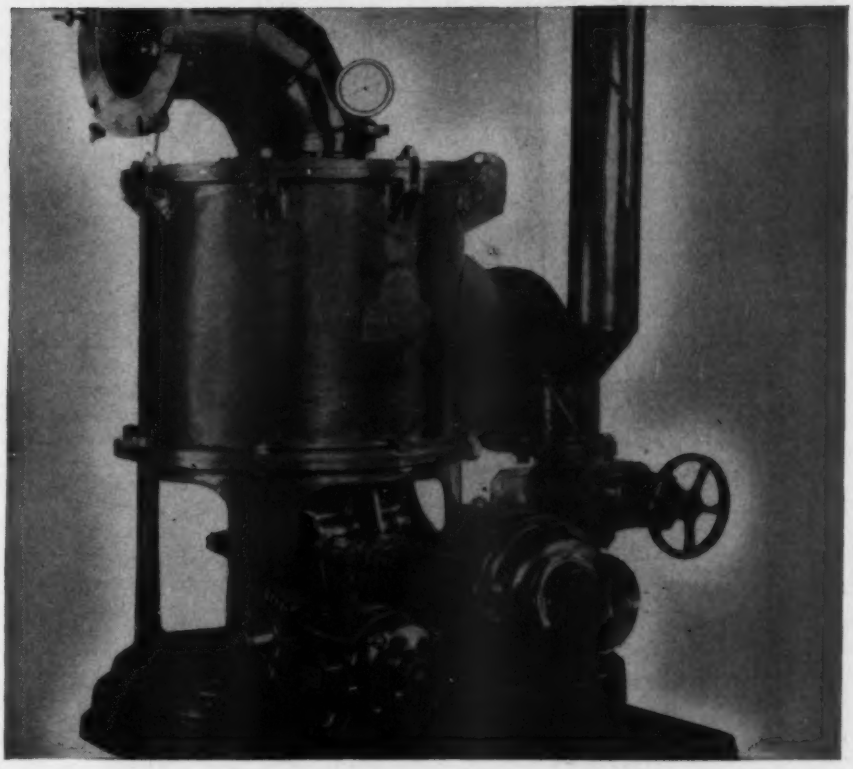
## MATHIESON CORP. SETS UP NEW SOUTHERN SALES AREA

A new southern sales area, with headquarters at New Orleans, and new district sales managers at New Orleans and Houston, have been announced by Mathieson Chemical Corporation (formerly The Mathieson Alkali Works). Vernon Woodside will be in charge of the New Orleans sales district and Roland F. Boehm will be in charge of the Houston sales district.

Mr. Woodside joined the Mathieson organization in 1936 as a member of the Sales Development and Technical Service Department, and, until his present appointment, specialized in technical service to the pulp and paper industry. Mr. Boehm has been with the company since 1946 and succeeds W. S. Hammond, recently deceased, as District Sales Manager of the Houston Sales District.

▼

▶▶▶ A TABLOID FORMAT has been assumed by *Handling Materials* in its initial 1948 issue. Now known as *Handling Materials-Illustrated*, the magazine is published quarterly by Towmotor Corporation, Cleveland, and is distributed through Towmotor representatives to approximately 40,000 readers. Requests for copies may be addressed to the company at 1226 East 152nd Street, Cleveland 10, Ohio.



**Has longer useful life too**

⅜-inch, 10% Nickel-Clad Steel was used for this pulp selectifier body; fabricated by Shartle Brothers Machine Co., Middletown, Ohio.

● ***PULP SELECTIFIER USES***

# LUKENS NICKEL-CLAD STEEL

## to avoid rust spots in paper

Lukens Nickel-Clad Steel provides here, at lower cost, all the advantages of solid nickel —an interior surface of nickel resistant to corrosion, thus assuring long life for this pulp selectifier and avoiding rust spots in the finished paper.

Paper-making machinery employs Lukens Clad Steels at many points, not only to protect quality of product, but also as a means of cutting costs. Original equipment usually costs less. Paper spoilage is reduced, cleaning of machinery is facilitated and upkeep work greatly reduced.

Each Lukens Clad Steel—Nickel-Clad, Stainless-Clad, Inconel-Clad or Monel-Clad —is a precision product controlled from assembly to finish, consisting of a layer of the corrosion-resistant metal permanently bonded to a steel backing plate. Standard claddings of 10% or 20% of total plate thickness suit most applications, but other percentages are available by special arrangement.

Lukens Clad Steels represent the most complete range available to industry. For additional information, write for Bulletins 338 and 255, Lukens Steel Company, 408 Lukens Building, Coatesville, Pennsylvania.

CLAD METAL STEEL

**LUKENS**

Nickel-Clad Stainless-Clad
Inconel-Clad Monel-Clad
**STEELS**

**SOLID METAL ADVANTAGES WITH CLAD STEEL ECONOMY**

## AMER. INST. OF CHEMISTS HONORS DR. C. A. THOMAS

The Silver Anniversary meeting of The American Institute of Chemists was held May 7 at the Waldorf-Astoria, New York.

The afternoon program featured an address by Dr. Foster D. Snell, retiring president, followed by a panel of speakers on the theme, "The Professional Activities of Other Societies." The speakers and their groups were: Charles C. Wilson, American Institute of Electrical Engineers; Dr. W. A. Mosher, American Chemical Society; E. Lawrence Chandler, American Society of Civil Engineers; and W. T. Nichols, American Institute of Chemical Engineers.

At the evening session Dr. Charles Allen Thomas, executive vice president and technical director of Monsanto Chemical Company, was presented the 1948 gold medal of The American Institute of Chemists.

In making the award, Dr. Snell stated that it was in recognition, not only of Dr. Thomas' work in the development of atomic energy and his leadership in research, particularly in synthetic resins, but also for his administrative ability and his encouragement of basic research. Francis J. Curtis, vice president of Monsanto, then spoke on "The Career of the Medalist."

▼

## NAT'L PAPER TRADE ASS'N ANNOUNCES NEW OFFICERS

The National Paper Trade Association at its forty-fifth annual meeting in New York the week of April 5 elected the following officers:

*President*—Ralph G. Luff, of the D. L. Ward Company, Philadelphia.

*Vice-President, Fine Paper Division*—L. A. Ramaker, of the Bouer Paper Co., Milwaukee.

*Vice-President, Wrapping Paper Division*—L. S. Pollock, of the Pollock Paper & Box Company, Dallas.

*Treasurer*—J. O. Bulkley, Bulkeley, Dunton & Co., New York.

*Executive Secretary*—A. H. Chamberlain, New York.

During the convention, a Trade Practice Conference was held with Federal Trade Commissioner Lowell B. Mason the annual guest speaker of the convention. A group of representatives of the Commission met with members of the industry for the formulation of rules to govern the industry's relations with its customers and each other.

During the convention, Cola G. Parker, president of the Kimberly-Clark Corporation, president of the American Paper and Pulp Association, told the distributors that the manufacturers would provide the dealers with all the paper that the nation requires.

E. W. Tinker, executive secretary of the American Paper and Pulp Association, foresaw some difficulties for the paper industry in the European relief program, but believed that the impact would not necessarily be too severe.

▼

## MIAMI VALLEY DIV. SUPTS. MEETS AT ORR FELT PLANT

The second annual get-together of the Miami Valley Division of the American Pulp and Paper Mill Superintendents Association was held on April 22 at the plant of The Orr Felt & Blanket Company in Piqua, Ohio. Members heard Harold H. Burrows, Raybestos-Manhattan Company, speak on "Rubber and Rubber Covered Rolls," and were guided through the Orr textile mill and laboratory.

Division Chairman Arthur F. Gardner, Champion Paper & Fibre Company, Hamilton, Ohio, presided over the sessions. Arthur H. Wilson, also of Champion, is secretary-Treasurer.

▼

## CANADIAN TECH. SECTION PLANS SUMMER MEETING

The 1948 Summer Meeting of the Technical Section, Canadian Pulp and Paper Association will be held at Harrison Hot Springs, British Columbia, September 8, 9, and 10, in the Harrison Hot Springs Hotel. This is the first meeting of the Technical Section to be programmed on the West Coast, and the Pacific Coast Branch of the Section will act as hosts to the meeting.

Invitations to delegates who wish to visit West Coast mills have been extended by B. C. Pulp & Paper, Ltd.; Bloedel, Stewart & Welch, Ltd.; Pacific Mills Limited; Powell River Company, Limited; Sidney Roofing & Paper Company, Ltd.; Sorg Pulp Company, Limited; Westminster Paper Company, Ltd. All correspondence relating to mill visits should be addressed to the Secretary of the Pacific Coast Branch, J. C. W. Evans, Sorg Pulp Company, Limited, Port Mellon, British Columbia.

A special train leaving Montreal on September 3 which will be joined by special cars from Toronto will carry delegates to the meeting from the East. Requests for train reservations should be addressed to the office of the Secretary - Engineer. Hotel reservations should be addressed to O. W. Anderson, manager of the Harrison Hot Springs Hotel.

▼

▶▶▶ THE ANNUAL MEETING of the Paper Makers Advertising Association was held in New York during the week of April 5. New officers are: Richard A. Faulkner, International Paper Company, president; Bradley E. Stafford, Strathmore Paper Company, and Frank C. Gerhart, Champion Paper & Fibre Company, vice presidents; Raymond F. Walter, Chemical Paper Mfg. Company, treasurer; and Richard S. Fay, Marvellum Company, secretary.

▼

▶▶▶ THE 1948 CONVENTION of the Direct Mail Advertising Association will be held in Philadelphia, September 29, 30, and October 1, at the Benjamin Franklin Hotel. Committee personnel have been announced by the association president, Charles B. Konselman, A. & M. Karagheusian, Inc., New York.

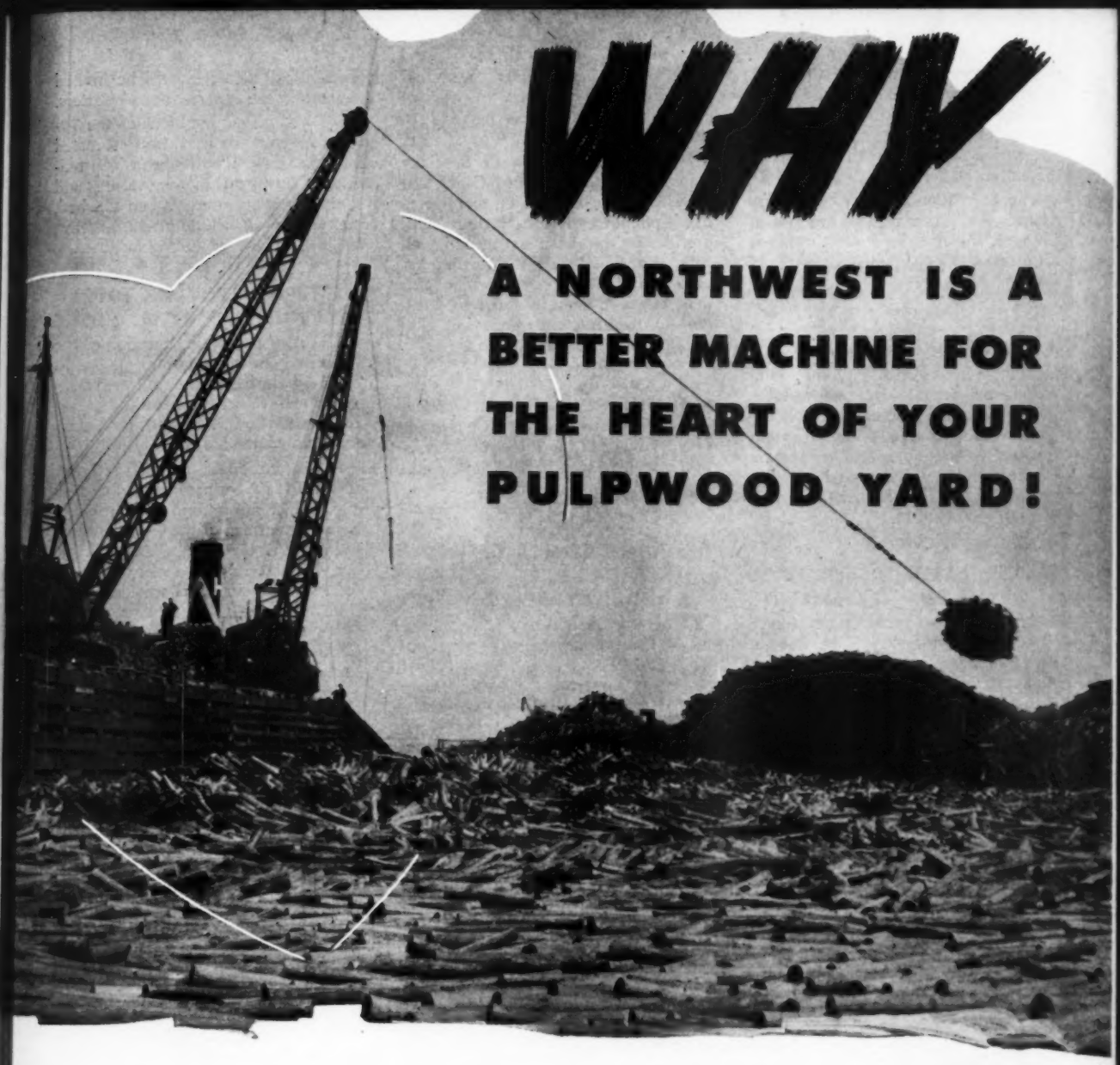
▼

## ADVISORY BOARDS PLAN FIRST WEST. PACKAGING EXPOSITION-CONFERENCE

Plans for the First Western Packaging Exposition and Conference on Packaging, Packing and Shipping were significantly advanced at a meeting of Pacific Coast packaging leaders held recently in San Francisco.

The exposition, first major event of its kind ever projected for the far west, will be held in the San Francisco Civic Auditorium, August 10-13. Some 100 companies engaged nationally and regionally in the manufacture and distribution of machinery, equipment, materials, supplies and services in the fields of packaging, packing and shipping will exhibit.

Concurrent with the first three days



# WHY

## A NORTHWEST IS A BETTER MACHINE FOR THE HEART OF YOUR PULPWOOD YARD!

When you buy a Crane for handling your pulpwood you are buying a *Key Machine*. If your pulp yard cranes are "down" your mill output slows. Your Crane is the heart of your immediate supply and you can't afford anything but the best for the heart of the job.

Your Northwest Crawler Crane will do things no track type machine can do. It will unload a whole train of cars without an extra line of track. It can travel through drop-end gondolas, unloading as it goes. It will load from side or end and it makes better use of storage areas through its 180° coverage.

Northwests low cost performance comes from four main things—high output, low-cost maintenance, dependability, and a combination of advantages found on no other similar equipment.

These assets are the reasons why one out of every three Northwests sold is a repeat order in the hands of a satisfied customer. Ask about Northwest design and Northwest advantages. There is a Crane of the right capacity for that *Key Spot*—the best for the heart of the job. 4 to 44 tons capacity.

NORTHWEST ENGINEERING CO., 1507 Field Bldg., 135 South LaSalle St., Chicago 3, Ill.

# NORTHWEST

*The Crane that goes Anywhere!*

of the exposition will be the First Western Conference on Packaging, Packing and Shipping with leading authorities discussing current trends and major problems in these fields in the eleven western states.

The exposition and conference are sponsored and managed by the firm of Clapp & Poliak. General chairman is Kenneth K. Dean, publisher of *Good Packaging*.

▼

▶▶▶ REPRESENTATIVES OF 120 American and Canadian chemical companies met in Boston April 8 for a joint session on chemical market research sponsored by the Chemical Market Research Association and Massachusetts Institute of Technology, Chief speaker of the session was George F. Doriot, professor of industrial management at Harvard University.

▼

## WAXED PAPER INSTITUTE PLANS SUMMER MEETING

An industry-wide meeting of waxed paper manufacturers will be held at the Homestead, Hot Springs, Virginia, June 10 and 11. The Waxed Paper Institute, Inc., Chicago, has invited representatives of all waxed paper manufacturers to attend the two-day session to exchange ideas on mutual problems and questions. Wives of members have also been invited to attend.

William P. Patterson of Specialty Papers Company, Dayton, Ohio, and newly-elected chairman of the Executive Committee of the Institute, will preside at the business meeting on June 11 and will make the opening address. In addition to the regular business session, the meeting will include a golf tournament, reception, and banquet.

▼

▶▶▶ THE SEVENTEENTH annual Packaging Exposition and Conference of the American Management Association was held at the Cleveland Auditorium, April 25 through 30.

▼

## RESEARCH CENTER OPENED IN CHICAGO BY WESTERN SOCIETY OF ENGINEERS

The establishment of a research center where engineering organizations may gather became a reality May 1 when the Western Society of Engineers moved to its new headquarters at 84 East Randolph Street, Chicago. Other organizations of similar interests and professional standards will be invited to share in the expanded headquarters.

W. V. Kahler, president of the 79-year-old organization, has estimated that the society will spend approximately $100,000 in renovating and equipping the center. When finished, the center will include meeting rooms, offices, lounges and dining facilities.

▼

## WESTERN NEW YORK TAPPI ADDRESSED BY A. STONE

The regular monthly meeting of the Western New York Group of TAPPI was held April 9 at the mill of the International Paper Company, Niagara Falls, New York. About 160 members and guests attended the dinner.

R. G. Macdonald, national secretary of TAPPI, gave a preview of the coming TAPPI fall meetings, and H. C. Ireland, chairman of the Canadian Pulp and Paper Association, Technical Section, Niagara Branch, spoke on the activities of this organization. The speaker of the evening was A. Stone, general manager of the International Envelope Corporation, who discussed "Men and Management."

▼

## COMING EVENTS

June 3-5—Spring meeting of the Empire State TAPPI, as sponsors, together with the Northern New York and Canadian Superintendents, Hotel Woodruff, Watertown, N.Y.

Aug. 10-13—First Western Packaging Exposition and Conference on Packaging, Packing and Shipping at the Civic Auditorium, San Francisco, Calif.

Aug. 25-27 — TAPPI (National) fall meeting, Fundamental Research Committee, Madison, Wis.

Sept. 8-10—Summer meeting of the Technical Section, Canadian Pulp and Paper Association, Harrison Hot Springs, B.C.

Sept. 13-17—Third Instrument Conference and Exhibit, Philadelphia Convention Hall, Philadelphia, Pa.

Sept. 27-29 — TAPPI (National) fall meeting, Mechanical Pulping Committee, Poland Springs, Me.

Oct. 11-13—TAPPI (National) fall meeting, Testing Division, Pittsburgh, Pa.

Oct. 12-16—Fifth National Chemical Exposition by the Chicago Section of the American Chemical Society, Chicago Coliseum, Chicago, Ill.

Oct. 18-22—Thirty-sixth Annual Safety Congress, Chicago, Ill.

Oct. 25-28—TAPPI (National) fall meeting, Third Engineering Conference, Buffalo, N.Y.

Oct. 28-30—Meeting of National Paper Trade Association, Hotel Stevens, Chicago, Ill.

### STATED MEETING

Chicago Professional Paper Group meets the third Monday of each month at the Chicago Bar Association, Chicago, Ill. (except July and August).

STEBBINS service is devoted exclusively to linings and tile tanks and provides:

One source of Supply

One responsibility for Satisfactory Service

ONE standard of quality

STEBBINS installations are in pulp and paper mills throughout the North American continent and by virtue of full export facilities in Central and South America and the Orient.

Test this service next time you have a lining or tile tank problem.

SEMCO

Stebbins Engineering and Manufacturing Company

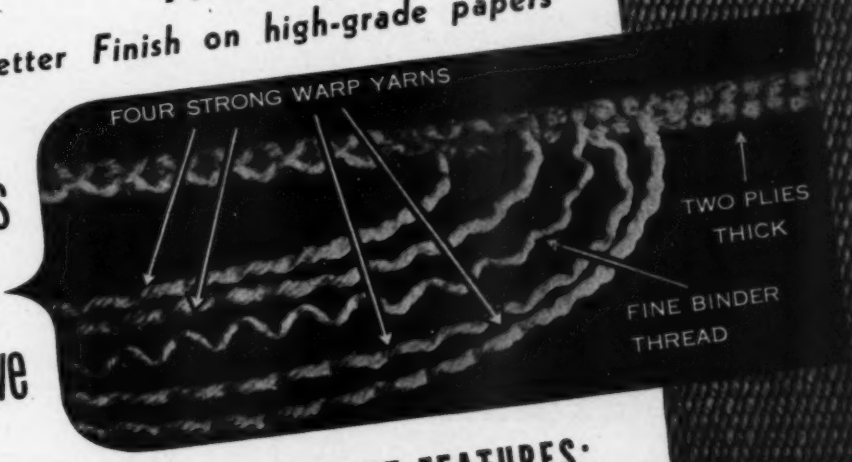
EASTERN BOULEVARD, WATERTOWN NEW YORK

# BRANDON
## "Multiple Weave"
## Cotton Dryer Felt

**A Smoother Surface:**

**for Better Finish on high-grade papers**

Here is the weave




## NOTE Closely these IMPORTANT FEATURES:

1. Surface threads go "over and under" only one filler—giving SMOOTH, FLAT surface. No sharp "knuckles" to mark your sheet. Better finish.
2. Same four (4) sets of strong WARP threads used in the 3-ply weave. Plenty rugged for fast running machines.
3. High porosity for fast drying. Medium weight—52-oz. square yard.
4. Actually two separate fabrics woven together—if one surface wears through, the other complete fabric holds the felt intact.

* Prestretched and equipped with Clipper Seam if desired. Available now from 80" to 170" wide. Same price as regular cotton felts.

## Morey Paper Mill Supply Co.

309 SOUTH STREET, FITCHBURG, MASSACHUSETTS

Sole Distributors of Dryer Felts Manufactured by

**BRANDON CORPORATION** • Greenville, S. C.

## MANDO EMPLOYEES COMPETE FOR FIRST AID TROPHY

The Fort Frances Paper Mill team captured the Mando First Aid Trophy for the second successive year in the Ninth Annual Inter-mill Contest sponsored by the Minnesota and Ontario Paper Company, Minneapolis.

The winners of this annual event, recently held at Kenora, Ontario, scored the highest of four plant teams in a spirited contest to correctly diagnose and treat the injuries of a patient in a simulated accident. R. W. Croucher, safety officer of Mando, was in charge of the contest and made the presentation of the trophy and pen and pencil sets to members of the winning team.

▶▶▶ FORESTRY MESSAGES on 15 by 45 feet all-steel signs have been erected by the Union Bag and Paper Corporation of Savannah, Georgia, on heavily traveled highways in Georgia. "Caution — Trees Working, Forest Fires Stop Their Growth" is typical of the messages which will be changed each six months.

▼

## AVOID CARELESSNESS WHILE TRAVELING OR CAMPING

The practice of being careful in the woods during vacation time is the subject of a national advertising campaign now being conducted by the American Forest Products Industries, Inc., Washington, D. C.

Newspapers throughout the country will be carrying specially prepared messages to impress vacationers, hunters, and travelers with the need for being careful in the woods.

Some of these advertisements will tell you that:

It's bad luck . . . to throw a lighted cigarette from your car . . . to be careless with fire in the woods . . . to start a grass fire . . . to throw away a match without breaking it!

Last season recorded some disastrous fires in which there was loss of life. Fires destroy our forests and often human life. Every traveler and vacationer should be safety conscious at all times.

▼

## SAFETY SCORES

▶▶▶ SINCE THE BEGINNING of the Paper Industry Safety Contest on June 30, 1947, the injury frequency rate for all contestants has decreased each month. The rate of 14.64 is 3 per cent lower for the July-February period than the July-January rate of 15.05. Contestants participating in this and the previous contest are showing a 16 per cent reduction in their rates for the eight-month period. Eighteen companies remain on the perfect record list.

### Division I—Pulp and Paper Mills

**Group A**

(None.)

**Group B**

(None.)

**Group C**

The Mead Corp. (Sylva Div.), Sylva, N.C.

Armstrong Cork Co., Pensacola, Fla.

**Group D**

Hollingsworth & Whitney Co. (Abenaquis Mill), Madison, Me.

Container Corp. of America, Carthage, Ind.

Certain-teed Products Corp., Dallas, Tex.

Fort Wayne Corrugated Paper Co., Vincennes, Ind.

National Gypsum Co., Garwood, N.J.

Riegel Paper Corp. (Hughesville Plant), Riegelsville, N.J.

Kimberly-Clark Corp., Kapuskasing, Ont., Can.

Container Corp. of America (Western Container), Tacoma, Wash.

### Division II—Paper & Board Manufacturing

**Group A**

(None.)

**Group B**

Canadian Cellucotton Products Co., Ltd., Niagara Falls, Ont., Can.

Old Colony Envelope Co., Westfield, Mass.

**Group C**

Ft. Wayne Corrugated Paper Co. (Rochester Div.), Rochester, N.Y.

Thilmany Pulp & Paper Co. (Bag Mill), Kaukauna, Wis.

The Flintkote Co. (Hollywood Paper Box Div.), Los Angeles, Calif.

The Hankins Container Co., Chicago, Ill.

Essex Paper Box Mfg. Co., Newark, N.J.

Bay West Paper Co., Green Bay, Wis.

**Supercalender Rolls**
Capacity up to 250" face

**Embossing Rolls**
Matrix rolls, paper or felt, and engraved rolls

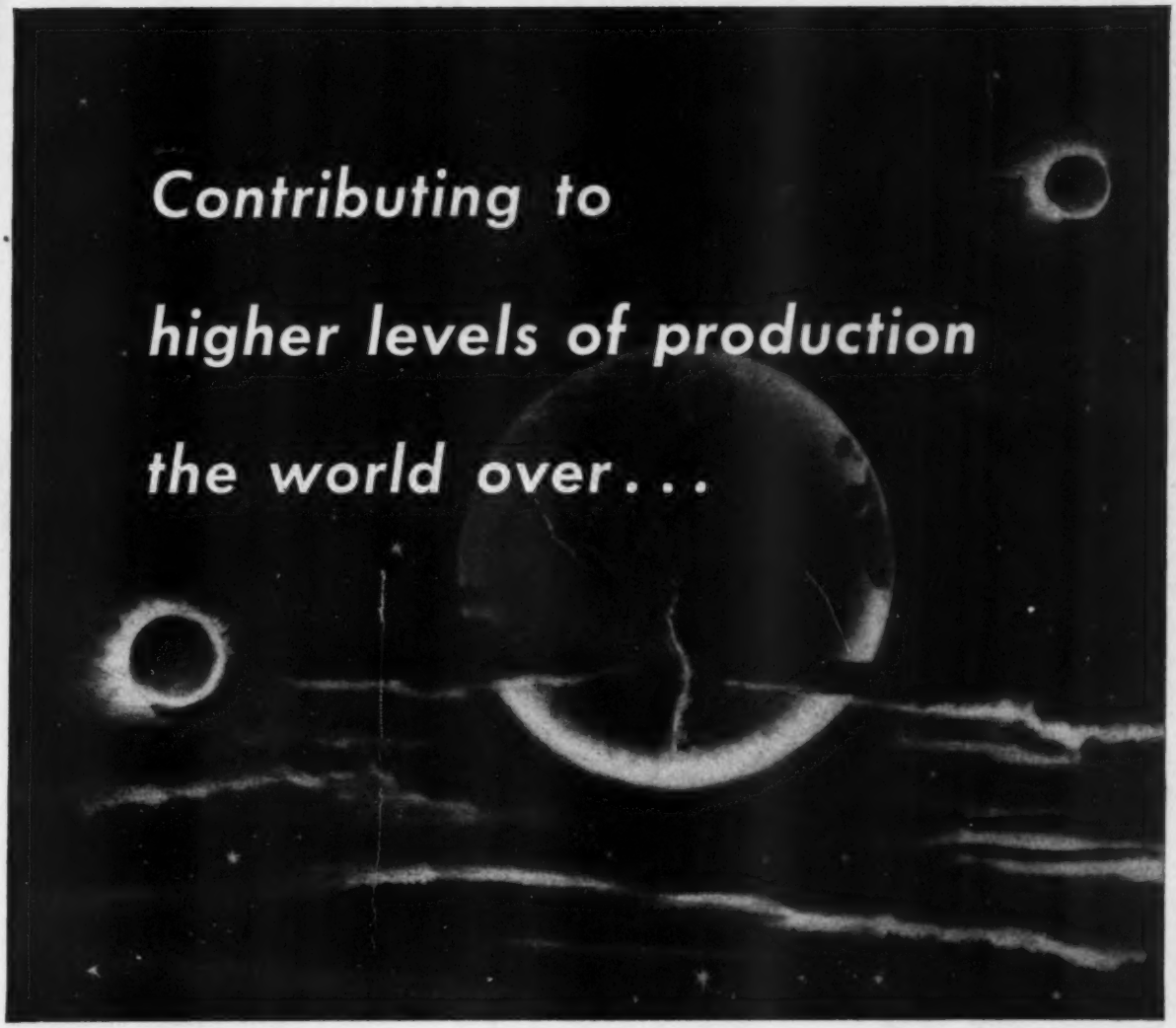
**Embossing Machines**
Constructed for heavy duty work

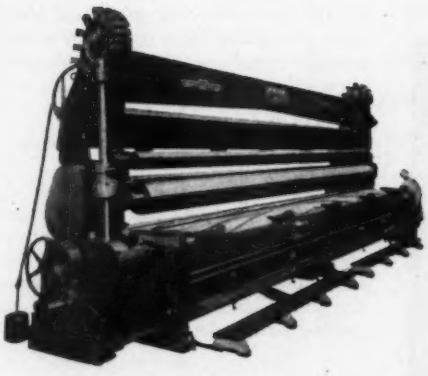
**Laboratory Calenders**
Especially equipped for control or research work

**Special Anti-Friction Installations**
Permitting higher speeds on existing equipment

**Crowned, Wormed or Flat Carrying Rolls**
Dynamically balanced for high speed

**The Wheeler Roll Co.**
1910 Lane Blvd. Kalamazoo, Michigan



**CAMACHINE 20,** the largest of the mill type Camachines, is a popular pacemaker in high speed paper mill operation. Camachine 20 produces firm, uniformly wound rolls of newsprint, kraft or book paper at speeds up to 5000 fpm, handling webs from 180" to 310".

SWIFT CAMACHINES are singing a song of production in every continent of this world. Side by side with other great products of American engineering skill, Camachines are helping the peoples of all countries to rebuild toward a better life. At home, Camachines are meeting every industrial slitting and roll-winding problem to help boost production to the higher levels which must be achieved in the years ahead. For competent assistance with your roll production problems, consult

**Cameron Machine Company, 61 Poplar Street, Brooklyn 2, N. Y.**

# Camachines

FOR FAST, TOP QUALITY ROLL PRODUCTION

*...the world over*

## PERSONALS

### VAN DE CARR, JR., IS NEW PRESIDENT OF MEAD CORP.

Last month, George H. Mead retired as chairman of the board of The Mead Corporation, Chillicothe, Ohio. He will continue as honorable chairman. This change is in keeping with the company's policy of retiring officers at the age of 70.

Advancement of executives following this change are: Sydney Ferguson, company president, becomes board chairman; C. R. Van de Carr, Jr., former vice president, becomes president; J. O. Masson, former operating vice president, becomes executive vice president and director; H. E. Whitaker is now operating vice president; Al H. Mahrt, former treasurer, is advanced to vice president and director; and George Robinson is treasurer.

▼

▶▶▶ Editor of The Institute of Paper Chemistry, Appleton, Wisconsin, *Clarence J. West,* has been elected president of the Appleton Rotary Club and will assume office July 1, succeeding *Leonard Smith,* manager of the Appleton mill of Consolidated Water Power and Paper Company. New vice president is *James Wagg,* former superintendent of Strathmore Paper Company and American Writing Paper Corporation.

▼

### RAYONIER ASSIGNS FRED DOHERTY TO FERNANDINA AS ASST. RES. MANAGER

From the position of pulp mill superintendent at its Shelton (Wash.) plant, Rayonier Incorporated has transferred Fred B. Doherty to its plant at Fernandina, Florida, as assistant resident manager.

Mr. Doherty has a background of paper mill experience. He is a graduate of the University of Washington, with a degree in chemical engineering, and has been associated with the company since 1933 when he joined the Grays Harbor Pulp and Paper Company, now Rayonier's Grays Harbor Division, in the state of Washington.

In 1935, Mr. Doherty was transferred to Port Angeles (Wash.) and later to the Central Chemical Laboratory at Shelton where he assisted in research work on the use of southern pine which preceded the construction of the Fernandina mill. Later, he became tour foreman at Shelton, leaving for service with the Naval Reserve for five years. He returned to Shelton to the position from which he has just been transferred.

▼

### R. J. BARTON LEAVES U.N. TO GO WITH MARATHON

After serving with the United Nations for a period of 18 months, R. J. Barton has been appointed to the position of sales training supervisor for the Field Selling Department of Marathon Corporation, Menasha, Wisconsin.

Mr. Barton has had a varied career in the teaching of wholesale and retail distributive methods, having been associated with such organizations as Kopper's, Warner Brothers, and as training director, eastern division of the Great Atlantic and Pacific Tea Company. It was from this latter position that he was loaned to U.N. to fill the post of assistant chief, Training and Staff Activities Division.

*R. J. Barton*

▼

▶▶▶ Executive changes announced by The Falk Corporation, Milwaukee, include the appointment of *J. A. Butler* as treasurer of the company. Formerly assistant treasurer and comptroller, Mr. Butler has been associated with the company for eleven years; he has been assistant treasurer since 1941. He was a certified public accountant for many years before joining Falk.

▼

### H. J. WEBB HAS RETIRED FROM OFFICE AT BATHURST

The retirement of H. J. Webb, as vice president and secretary-treasurer of the Bathurst Power and Paper Company, Montreal (plant at Bathurst, N.B.), and the appointment of R. H. Christian to replace him has been announced.

An officer and director of the company since its formation in 1928, Mr. Webb will continue to be a member of the board of directors. His successor has been Mr. Webb's executive assistant for the past year. Formerly, he was connected with Abitibi Power and Paper Company for 16 years.

▼

▶▶▶ Appointment of *J. C. McKenna* as manager of chromium chemical sales has been announced by the Diamond Alkali Company, Pittsburgh. Mr. McKenna, associated with Diamond Alkali for the past twenty-six years, will have charge of selling close to a third of the nation's total supply of chromium chemicals.

▼

▶▶▶ The position of sales manager of the Fresh'nd-Aire Company, Chicago, has been given to *John W. Wallace,* succeeding the late D. B. Huggard. A member of the company since 1944, Mr. Wallace will supervise the launching of the new Model 600 room humidifier and the 1948 models of electric air circulators.

▼

▶▶▶ *Thomas T. Parker,* pressed metal manufacturing engineer, has assumed his new post in that capacity at the Portland, Oregon, plant of the Hyster Company. Mr. Parker has been assistant to the superintendent at the By-Products Steel Corporation, a subsidiary of Lukens Steel Company.

# You can AVOID STREAM POLLUTION

## profitably!

How? It's easy with a Permutit White Water Reclaimer! Pulp fibre and filler are reclaimed from white water . . . to make more paper and more profits! The remaining water can then be re-cycled as process water again and again. The Permutit White Water Reclaimer turns what was once waste into paper and profits! And clears up stream pollution to boot!

Consult Permutit engineers without obligation! Just write to the Permutit Company, Dept. PI-5, 330 West 42nd Street, New York 18, New York, or to the Permutit Company of Canada, Ltd., Montreal.

# Permutit

FOR 35 YEARS WATER CONDITIONING HEADQUARTERS

## COURTNEY REEVES NAMED CARTER, RICE PRESIDENT

Bulkley, Dunton & Company, New York, has announced the appointment of Courtney H. Reeves as president and general manager of Carter, Rice & Company Corporation, its wholly owned subsidiary.

Mr. Reeves formerly was vice president of Allied Paper Mills, a position he resigned on April 1 after seventeen

*Courtney H. Reeves*

years' association with the company. Prior to that he was director of sales of Paper Mills Company, Chicago, for six years. He started his career with Dill and Collins in his native Philadelphia, and spent six years with that company. During this time he covered the New England territory.

For a good many years past, Mr. Reeves has taken a keen interest in the activities and management of the Salesmen's Association and was president of that group in 1942 and 1943.

▼

▶▶▶ The post of eastern sales manager has been given to *Arthur L. Smith* by Paterson Parchment Paper Company, Bristol, Pennsylvania. The appointment became effective April 21. Mr. Smith is in charge of the company's New York office and will make his headquarters there. He is well known in the eastern territory having been with Paterson since January, 1923.

▼

## NOPCO CHEMICAL COMPANY NAMES 3 VICE PRESIDENTS

The board of directors of Nopco Chemical Company (Harrison, N.J.) authorized the creation of the office of assistant vice president and designated President Charles P. Gulick to appoint two or more persons to serve in that capacity. Those appointed were Dr. Charles I. Post, C. Arthur Larry, and Dr. Edwin A. Robinson.

Dr. Post will be in charge of the company's Vitamin Division, where he has been serving as general sales manager. Mr. Larry will be assistant vice president in charge of the Purchasing Department for Nopco and all its subsidiaries. Dr. Robinson, formerly in charge of the Textile Rayon Section of the Nopco Sales Department, will be in charge of all Laboratories, Sales Development and Market Development Departments of the Industrial Division.

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▶▶▶ President of the National Gypsum Company, Buffalo, *Melvin H. Baker,* has been elected to the board of directors, United States Chamber of Commerce, representing the Second District (New York, New Jersey, Pennsylvania, and Delaware).

▼

▶▶▶ Ebasco Services Incorporated have appointed *A. P. Schnyder* as engineer for pulp and paper mills. Mr. Schnyder had been associated with the late George F. Hardy for over twenty years, prior to which he served with several European engineering firms. He was graduated from the Federal Technical University in Zurich in 1921.

▼

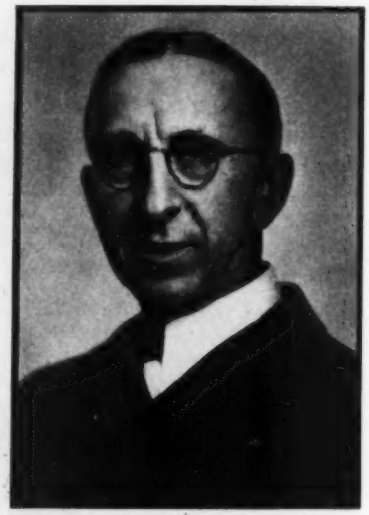
▶▶▶ Management of the steel plants of Lukens Steel Company (Coatesville, Pa.) has been placed in the hands of *L. P. McAllister,* who has been with the company since 1922. He has served successively as assistant manager of tests, engineer of tests, metallurgical sales engineer and metallurgical engineer until 1944, when he was appointed assistant to the general superintendent.

*L. P. McAllister*

## E. J. TRIMBEY DELEGATE TO ROTARY INT. CONVENTION

E. J. Trimbey, head of the Trimbey Machine Works, Glens Falls, New York, accompanied by Mrs. Trimbey, left New York May 3 for Rio de Janeiro, Brazil.

The Trimbeys sailed on the flagship New Amsterdam of the Holland-American line which was chartered by Rotary International for carrying dele-



*Edward J. Trimbey*

gates to its 39th Annual Convention in Rio de Janeiro May 16 to 20. Mr. Trimbey is a delegate from the Glens Falls Rotary Club.

The cruise, which will include a number of interesting stopovers, will return to New York June 3.

▼

▶▶▶ New president of the Pacific Coast Association of Pulp and Paper Manufacturers is *Lawson Turcotte,* of Puget Sound Pulp and Timber Company, who succeeds Jack Smith, of Hawley Pulp & Paper Company. Other officers are: *Anson Moody,* Everett Pulp & Paper Company, vice president; *Alexander R. Heron,* Crown Zellerbach, executive vice president; and *Robert Wertheimer,* Longview Fibre Company, secretary-treasurer.

▼

▶▶▶ The appointment of *Walter Webb* as sales representative for the Philadelphia area has been announced by U. S. Stoneware Company, Akron, Ohio. Mr. Webb took over the new position on April 12. His previous connection was that of general superintendent with Ralph V. Rulon, Inc., Philadelphia. He has had wide experience in the corrosion-resistant field and has many developments for the use of corrosion-resistant materials to his credit.

# TENAX FELTS ARE TOUGH

SERVING THE PAPER INDUSTRY SINCE 1891

Our field men are at your service as is our plant and all its people. We invite your inquiries.

**LOCKPORT FELT COMPANY • NEWFANE, NEW YORK**

**WATER SYSTEMS FOR THE LARGEST**

**Chemical PLANTS**

ALMOST all of the Nation's largest and finest chemical plants own and use Layne Well Water Systems exclusively. It is in the Layne Systems that the most critical engineers and operational superintendents have found: 1.—definitely outstanding efficiency; 2.—extraordinarily fine and long lasting quality, and 3.—dependability in years and years of constant peak load operation.

But chemical plants are not alone in such preference. Check the hundreds of cities, railroads, packing houses, tire manufacturers, steel mills, petroleum refineries, army camps, naval stations, big air conditioning and irrigation projects—in fact almost every big well water user in the United States, Canada and Mexico. There too, you will find almost exclusive use of the world famous Layne Well Water Systems. Such uncontested leadership is ample proof of superiority. For literature, address Layne & Bowler, Inc. General Offices, Memphis 8, Tennessee.

**LAYNE WELL WATER Systems**

AFFILIATED COMPANIES: Layne-Arkansas Co., Stuttgart, Ark. * Layne-Atlantic Co., Norfolk, Va. * Layne-Central Co., Memphis, Tenn. * Layne-Northern Co., Mishawaka, Ind. * Layne-Louisiana Co., Lake Charles, La., * Louisiana Well Co., Monroe, La. * Layne-New York Co., New York City * Layne-Northwest Co., Milwaukee, Wis. * Layne-Ohio Co., Columbus, Ohio * Layne-Pacific, Inc., Seattle, Wash. * Layne-Texas Co., Houston, Texas * Layne-Western Co., Kansas City, Mo. * Layne-Western Co. of Minn., Minneapolis, Minn. * International Water Supply Ltd., London, Ont., Can. * Layne-Hispano Americana, S. A., Mexico, D. F.


▶▶▶ *Collins F. Fuller* has joined the staff of the Quartermaster Food and Container Institute for the Armed Forces, Chicago, as chief of the Container Analysis Division, Container Laboratories. He had been employed formerly by the Diamond Match Company, the Canadian Beaverboard Company, and the American Boxboard Company and was founder and president of the Wood and Fiber Products Company, Grand Rapids, Michigan, and later of the Fuller Box Company, Chicago.

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▶▶▶ Controller of the Ohio State University, Columbus, Ohio, *Stillman Kuhns,* has been elected to membership in the Controllers Institute of America.

▼

▶▶▶ After operating his own consulting engineering firm in Manistee, Michigan, for the past two years, *H. R. Day* has become associated with Economy Pumps, Inc., Hamilton, Ohio, as special engineering consultant. He will specialize in the chemical, refining and process industries. Previous to the time he served with the Armed Forces, Mr. Ray was with Dean Brothers, Indianapolis, where he was connected with the engineering and sales departments of the centrifugal pump division.

▼

▶▶▶ Former general merchandise manager of the United Wallpaper Company, *B. C. Middleton,* has been appointed general sales manager of the Milwaukee Lace Paper Company. *L. C. Tobiason,* sales correspondent at the Milwaukee Lace Paper Company, has been promoted to assistant sales manager.

▼

▶▶▶ The Owens-Illinois Glass Company, Toledo, Ohio, has announced the appointment of *Philip B. Niles* as public relations director. Mr. Niles formerly was connected with the American Water Works Company in the capacity of vice president.

▼

▶▶▶ Guest speaker at the open house of the Hudson Pulp and Paper Corporation, Palatka, Florida, on May 15 and 16 was *Gov. Millard F. Caldwell* of Florida. The event was to be sponsored by the Putnam County Chamber of Commerce.

▼

▶▶▶ Former sales member of James Gray, Inc., *Marvin L. Chase,* has resigned to form the Chase Direct Mail Service Corporation, of New York City. The organization will do lithography, letterpress printing, and a complete direct mail service.

▶▶▶ The election of *Robert M. Young* as vice president has been announced by Pond's Extract Company, New York City. Mr. Young is head of the division manufacturing Pond's Tissues. Previous to joining Pond's in 1943, he had been with the Scott Paper Company (Chester, Pa.) from 1931 until 1943.

**Robert M. Young**

▼

▶▶▶ Vice president of the Crown Zellerbach Paper Company (Camas, Wash.), *Victor E. Hecht,* spoke on the trends in the Pacific Coast paper industry at a dinner meeting of the Master Printers of Oregon at the Marion Hotel, Portland, on April 24.

▼

▶▶▶ The election of *Edmund Hoffman* as secretary and treasurer of the American Can Company, New York City, to succeed R. A. Burger, who is retiring after forty-seven years with the company, has been announced. Mr. Hoffman has been manager of the industrial relations department since 1944.

▼

▶▶▶ The appointment of *Donald G. Dyer* to its Adhesive-Sales Service Division has been announced by Philadelphia Quartz Company, Philadelphia. Mr. Dyer has had special training in silicate uses to industry, with emphasis on adhesive applications. He also is experienced in servicing fine recording instruments. His duties will include special service in adhesives for corrugated board.

▼

▶▶▶ New executive vice president of the Jessop Steel Company, Washington, Pennsylvania, is *Edward M. Griffith,* who has headed several large companies during his 45 years in the steel business.

ACME PAPER PRODUCTS
COMPANY LIMITED
HEAD OFFICE
386 CARLAW AVENUE
TORONTO

Worthington Pump and Machinery Corp.,
Moore Steam Turbine Division,
Wellsville, New York.

Attn: Mr. C.R. Probst

Gentlemen: Re: SO-3104

In January, 1946 we installed a Worthington Moore Variable Speed Machine Drive. This is an SZ turbine with 12½" x 8" gear and is equipped with a variable speed oil pump oil relay governor.

Since that time the unit has been running steadily six days a week without any trouble whatsoever.

We are particularly well pleased with the performance of the variable speed oil relay governor which has given excellent regulation at all weights of paper.

We believed you would be interested in the above and shall be glad to have you refer anyone contemplating such a drive to us.

Yours truly,

ACME PAPER PRODUCTS COMPANY LIMITED

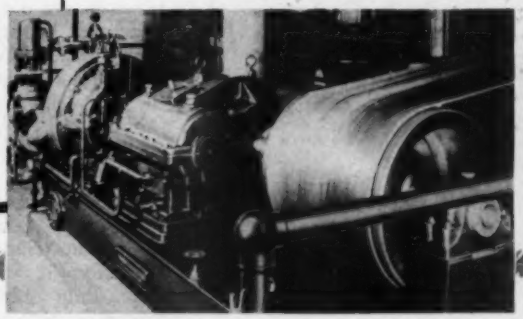
SCO:FB

Per, S. C. Gough
Chief Engineer.

# "Running steadily six days a week without trouble"

***A prominent Canadian Paper Company sends an enthusiastic report on Worthington Turbine Performance***

The Acme installation—a 200 hp Worthington belted paper machine drive unit consisting of turbine, reduction gear with pulley on separate shaft all mounted on baseplate. The turbine normally operates at 4800 rpm, reduced to 700 rpm by the gear and further reduced to 250 rpm by the belted drive. Turbine operates on steam at 175 lbs. pressure and exhausts at 5 to 30 lbs. back pressure.



For many paper machine drives, especially on small horsepowers, the type of Worthington unit shown is the most economical and convenient. Your own conditions may call for a different type of unit—direct connected to end of line shaft or direct connected to center of line shaft. Whatever your requirements, Worthington can meet them with a drive that will give you long-lasting, cost-saving efficiency on any size of paper or board machine.

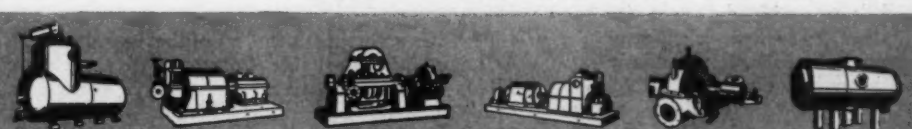
***Steady Speed*** is one of the many advantages of Worthington Steam Turbines. The variable speed oil relay governor allows speed adjustments over a range of 10 to 1, with no change in operating speed from minimum to maximum load for any given control setting. This reduces paper breakage, permits operation at higher paper speeds, increases stability at all loads.

For further facts proving *there's more worth in Worthington*, contact your nearest Worthington Office. *Worthington Pump and Machinery Corporation, Steam Turbine Division, Wellsville, New York.*

**WORTHINGTON**

78.7

A GREAT TEAM IN STEAM

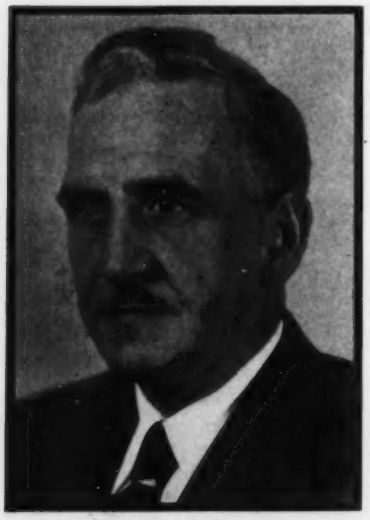


## TOOVEY NOW WITH CHENEY BIGELOW AS SALES ENGINEER

The recent appointment of T. W. Toovey as sales engineer has been announced by Cheney Bigelow Wire Works, Springfield, Massachusetts.

Most recently, Mr. Toovey has been associated with the Whitemarsh Research Laboratories of the Pennsylvania Salt Manufacturing Company, where he was pulp and paper technologist. In that position, he was investigating bleaching processes and applications of new chemicals in the pulp and paper field.

Previous to his affiliation with the Whitemarsh Laboratories, Mr. Toovey



*T. W. Toovey*

served as research chemist and technical consultant for Hermanetzer Papierfabrick, Harmanee, Czechoslovakia. There he developed a successful high alpha pulp process for nitrating pulp, which was adopted by the Czechoslovak government. Mr. Toovey also had been associated previously with the British Columbia Pulp and Paper Company, Port Alice (B.C.) in charge of cooking and bleaching.

Mr. Toovey is a member of TAPPI, the Engineering Institute of Canada, and the Association of Professional Engineers of British Columbia. He has contributed numerous articles to the literature of the industry.

▼

▶▶▶ A testimonial dinner was given by New York friends of *Harold O. Nichols* upon his departure for San Francisco to assume charge of the Crown Zellerbach Corporation's new multiwall bag division. Mr. Nichols has been manager of the company's New York offices for fourteen years, and is now president of the Kraft Paper Manufacturers Association.

# NECROLOGY

## THOMAS LUKE

A leading figure in the pulp and paper industry since the turn of the century, Thomas Luke, chairman of the board, West Virginia Pulp and Paper Company, passed away May 12 in New York City at the age of 77.

A dominant figure in the growth and progress of the company, Mr. Luke had a service record of 56 years in various capacities. He served for 22 years as vice president. Following the death of his brother, David Lincoln Luke, in 1934, he became president for 11 years. Since 1905, he has been a director of the company.

Mr. Luke directed the activities of the company until he reached the retirement age in 1945. When he retired from active management of the company, he not only waived his rights to a pension, but agreed to serve as chairman of the board without salary. In this capacity he took an active interest in the company's affairs, going to his office regularly until forced to abandon business routine because of ill health.

Mr. Luke was one of six sons of William Luke, a Scottish papermaker. All of the sons joined their father in a family enterprise which became West Virginia Pulp and Paper Company. The industrial birth of the company came in 1888 when the Piedmont Pulp and Paper Company was formed and a sulphite pulp plant was built across the Potomac River from Piedmont, West Virginia. The site of the original mill later became the incorporated town of Luke, Maryland.

In the days of the company's early expansion, Mr. Luke gained a reputation as an astute and capable operating man. For six years following construction of the Covington (Va.) plant in 1899, he directed its activities as manager. Today it is the largest plant operated by the company. Shortly after he became president, the company developed its activities in the South, building the kraft pulp and paper mill at Charleston, South Carolina in 1937.

▼

▶▶▶ Formerly superintendent of the American Writing Paper Company's Albion mill for many years, *Warren J. Landfare*, passed away suddenly April 20. He had been a salesman for the Appleton Wire Works, Appleton, Wisconsin, before his retirement in 1937.

## MARK WILDER BRAY

Mark Wilder Bray, chemist in charge of alkaline pulping investigations in the pulp and paper division of the U. S. Forest Products Laboratory (Madison, Wis.), passed away at his home on April 24. He was 58 years old.

Mr. Bray had joined the Department of Agriculture in 1920 and was assigned to pulp and paper research at the Forest Products Laboratory. His original detail was the chemical analysis of pulps. His assignment to alkaline pulping research followed and his activity in this field is attested by his numerous articles and reports on

*Mark Wilder Bray*

the chemistry of the alkaline processes and the relation of wood properties to the properties of sulphate pulp. He developed a method for producing easily-bleached sulphate pulp and was one of the pioneers in the development of multistage chlorine bleaching of southern pine sulphate pulp. Recently Mr. Bray was engaged in investigations of the effects of different types of decay in wood on pulp yields and properties.

A member of the TAPPI committee on alkaline pulping for many years, Mr. Bray currently was member of the executive committee of the TAPPI Lake States Section. His widow and a daughter survive.

▼

▶▶▶ President of the Carew Manufacturing Company (South Hadley Falls, Mass.), Courtlandt B. Griffin, passed away April 13 at Longmeadow, Massachusetts. He was a director of the Southworth Paper Company of West Springfield and a former vice president of the New England Paper Service Association.

# Don't take a chance when you buy *valves*

## Consult the Powell Engineering staff

Naturally you know your business better than any outsider. But your business is not making valves.

On the other hand, Powell has spent more than a century making valves—and valves only. So we believe we know more about valves than anyone else—at least anyone outside the valve making industry.

The result of this knowledge is the most complete line of industrial valves made today.

For services for which Bronze or Iron valves are best adapted, Powell makes every required type and design.

Where something more is needed, especially for higher pressures, Powell Cast Steel Valves of all types are available in pressure classes from 150 to 2500 pounds.

And to handle corrosive media, Powell makes a complete line of Corrosion-Resistant Valves in the greatest variety of metals and alloys ever used in making valves.

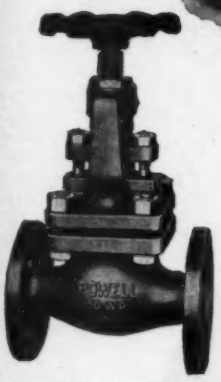


Fig. 1969—150-pound Stainless Steel Gate Valve with flanged ends, outside screw rising stem, bolted flanged yoke-bonnet and tapered solid wedge.

Fig. 1793—Large 125-pound Iron Body Bronze Mounted Gate Valve. Made in sizes 2" to 30", inclusive. Has outside screw rising stem, bolted flanged yoke and tapered solid wedge. Also available in All Iron for process lines.

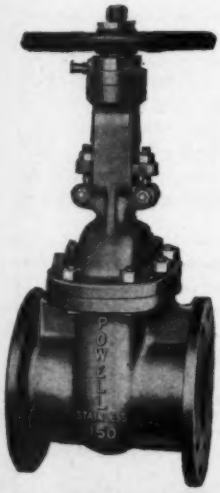


Fig. 2453-G—New, standard 150-pound Stainless Steel Gate Valve with outside screw rising stem, bolted flanged yoke-bonnet and tapered solid wedge.

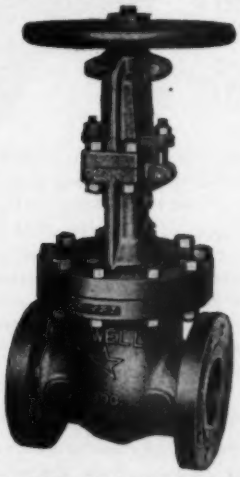


Fig. 3003—Class 300-pound Cast Steel Gate Valve with flanged ends, outside screw rising stem, bolted flanged yoke and tapered solid wedge.

Fig. 1886—Liquid Level Gauge, with screwed ends, for 350 pounds W. W. P. Powell offset pattern. Made in stainless Steel—Type 304 or 316.

**The Wm. Powell Co., Cincinnati 22, Ohio**

DISTRIBUTORS AND STOCKS IN ALL PRINCIPAL CITIES

# POWELL VALVES

# Announcing NOPCO KFH

A NEW VERSION OF NOPCO KF[*]

specifically designed for Hardwater Areas

Where does your mill fit into this picture? If it is located in any of the hard or moderately hard water areas shown on this map, then NOPCO KFH — new *hard-water* version of NOPCO KF — can definitely help you to solve some of the tougher problems of paper production. From Nopco KFH you'll get the same unsurpassed foam-killing effectiveness that has long distinguished Nopco KF in paper mills throughout the world. As an *important plus,* you'll also find Nopco KFH *more readily dispersible,* resulting in easier, speedier preparation of stock emulsions.

**The same quick action, dependability and economy.** Like NOPCO KF, NOPCO KFH needs but minutes to drive foam from the head-box, clear bubbles from the wire. Like KF, KFH improves sheet formation even at increased machine speeds, with better than 75% elimination of thin spots. What's more, Nopco KFH is proving as effective as Nopco KF in providing these advantages to mills in *soft-water* areas. For this reason—and because of its *greater ease of handling*—mill operators in soft-water regions will find Nopco KFH well worth investigating.

**NOPCO KFH,** in short, is another outstanding product added to an already versatile and successful line of NOPCO products — all acknowledged leaders in their field. NOPCO KFH is a further example of Nopco's continuing program of research, whose aim is to provide the Paper Industry with the most advanced developments in processing chemicals.

**See** what this *new chemical substance* — expressly formulated to aid sheet formation and eliminate foam in hard-water areas — can do in *your* mill. Why not include a barrel or two of NOPCO KFH in your next order for regular NOPCO KF?

**NOPCO CHEMICAL COMPANY, Harrison, N. J.**

formerly National Oil Products Company

Branches: Boston • Chicago • Cedartown, Ga. • Richmond, Calif.

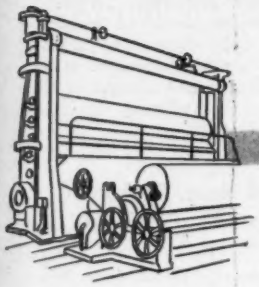
FOR KF PERFORMANCE IN HARD WATER

[*]REG. U.S. PAT. OFF.

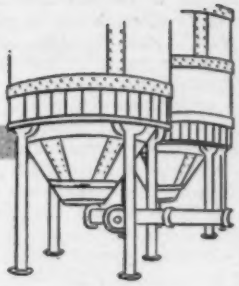
# NOPCO KFH

NOPCO TRADEMARK EVOLVED THRU RESEARCH

An Affiliate of the American Pulp and Paper Mill Superintendents Association



# Practical SHORTS



**Readers are invited to submit short, practical articles for this department. The items should be original and should relate to ways and means of handling production and maintenance jobs. Where possible, articles should be illustrated. Rough sketches only are required. Payment will be made for acceptable items upon publication.**

## Special Considerations for Wound-Rotor Motors

*Voltage Tests.* If a wound-rotor motor is not operating satisfactorily, a voltage-ratio test may indicate the trouble. With collector rings open-circuited, apply a reduced voltage to the stator and raise it gradually until conditions of normal voltage and normal frequency are obtained. Never raise the brushes to open-circuit the collector rings. Record the current in each stator line, and the voltage between each combination of the collector rings (1-2, 2-3, 3-1, etc.). If stator currents or rotor voltages are unbalanced, turn the rotor to other positions and observe whether the unbalanced condition is due to an irregularity in the stator or in the rotor. Unbalanced stator currents sometimes occur under normal conditions, but unbalanced rotor voltages usually indicate a defect.

*Caution.* On some high-flux-density machines, sufficient core-loss torgue is developed to cause the rotor to turn. It is not safe to hold the rotor stationary with the hands, because a short circuit may occur in the rotor windings and cause the rotor to attain full speed quickly. Preventive Maintenance of Electric Motors and Generators, TM55-405, War Department Technical Manual.

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## It's Easy to Weld Pulleys and Gears

When welding shops or plant maintenance crews repair broken cast iron pulleys and gears, expansion and contraction stresses are usually controlled by preheating the entire casting. In emergencies or when the casting is too big, a preheating furnace may not be practical. Here are some suggestions on how you can bronze-weld or fusion weld breaks in these castings by using your blowpipe flame for preheat. Bronze-welding is usually recommended because less heat is required than for fusion welding. Less heat produces less expansion.

### One Spoke Broken

When a single spoke is broken near the solid hub of a pulley, as shown in figure 1, the procedure for controlling stresses is simple. First vee the break from both sides. Then heat the entire gear with the blowpipe flame. It should be just warm enough so you can't hold your bare hand on the gear. Then heat the spoke on each side of the broken spoke slightly more than the rest. The rim section within the three spokes should also be heated a little more. At the same time, gradually heat the area at the break until it reaches bronze-welding heat. In this way, you can make the weld quickly without loosing the preheat applied to the adjacent spokes.

When the weld is completed, the adjacent spokes and rim section should be reheated slightly until the weld has begun to cool. Keep the entire part covered to avoid drafts and rapid cooling.

### Several Breaks

When there are breaks in the rim and spokes, as shown in Figure 2, the order of welding is important. After you vee the breaks properly, make spoke welds "A" and "B" in that order. Do not attempt weld "B" until weld "A" has completely cooled. Apply the preheat the same as you would for a break in a single spoke.

Weld the rim break last. With the blowpipe flame, heat the adjacent spokes. If the break is about half-way between spokes, heat both spokes alike. If the break is close to a spoke, give that spoke more heat. Also slightly heat the spokes on each side of the one near the weld. Use a jack or wedge bar to help keep the fractured ends slightly separated. Do not apply too much heat to the rim in the vicinity of the break or you will create pressure in the weld. The heating of spokes, plus a slight heat in the rim section, plus some form of jacking will help you maintain pitch dimensions. Again, avoid drafts and rapid cooling.

### Split-Hub Pulleys

Spokes of the split-hub type gear or pulley can be repaired easily, too. Prepare the fracture in the usual way. Then clamp a stub shaft of the correct diameter in the hub. This will prevent distortion of the hub. Then carry out the rest of the operation as you would for a single spoke break as shown for Figure 1.—*Linde Tips,* The Linde Air Products Company.

▼

## Safety Suggestions for All Employees

1. Handle material carefully. Keep your hands and feet and fingers in the clear as much as possible. Watch out for nails, slivers and the safety of your fellow worker. Keep out from under and in the clear of derrick loads.

2. Safeguard your eyesight by wearing protective goggles whenever the nature of your work indicates that they should be used. This is especially important when dressing tools on an emery wheel, in the

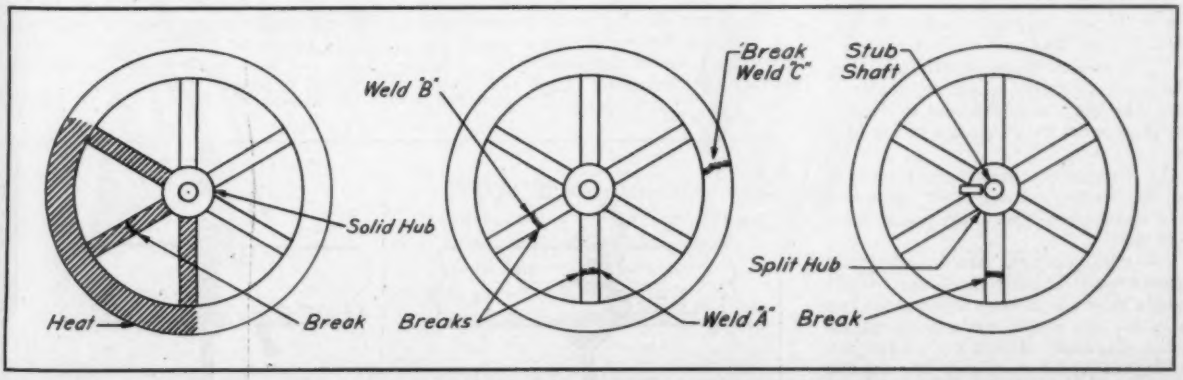


*Fig. 1 (left)—When a single spoke is fractured near the hub, heat the adjacent spokes and rim section. Keep even heat in the broken spoke and complete the weld. Fig. 2—(center)—When there are breaks in two spokes and the rim, welds are made in the order A, B, C. Use a wedge bar or jack to maintain pitch dimensions. Fig. 3 (right)—Before welding spokes of the split-hub type gear or pulley, clamp a stub shaft of the correct diameter in the hub. Then proceed as in Figure 1*

chipping of concrete and when working where concrete is apt to splash into the eyes. All men on welding or cutting work are to use goggles or helmets with colored protective glass. Never look at the electric arc or the flame of a welding torch without wearing special goggles, as otherwise your sight may be permanently impaired.

3. Help maintain the job in a clean and safe condition. Bend down all protruding nails in lumber and nail kegs. Dispose of food scraps and wrappings from lunches by dropping them in refuse barrels.

4. Avoid spraining your back. In picking up a heavy load assume a squatting position, with your back upright, using the arms and legs to make the lift. Get help when it is needed. Lift and lower together on instructions from the leader when several men are working together in carrying material.

5. Defective tools are dangerous. Don't use them. Have them replaced if the heads are mushroomed, or the handles are broken, loose or slivered. The hands and feet should be kept out of the line of travel of the tool where this can be done, so that a glancing blow will be less likely to cause an injury.

6. Inspect the tools, equipment, plank, scaffolds, machinery, ladders, etc., that you are using to be certain that they are safe. Any defects should be promptly corrected. Report unsafe conditions. Safeguards removed for any purpose shall be promptly replaced as soon as possible.

7. When the footing is slippery or treacherous, watch your step! Walk more slowly with short pauses so as to avoid a fall.

8. Ladders, scaffolds and runways shall be built substantially, inspected frequently, and maintained in good condition for safe use.

9. Wear well soled shoes and clothing suited for your work. Where heavy material is handled regularly, safety shoes or boots with a concealed built-in protective steel cap to protect the toes from being broken or crushed, are recommended.

10. Employees are expected to be physically fit to work. Any job is dangerous for men who are ill and unable to handle themselves properly.

11. Distraction of men using tools or machinery may cause a serious accident. Pay close attention to what you are doing. Learn the safe way to do your job. Then use it. If you don't know, ask your foreman. Do not take needless chances.

12. Horseplay, crowding, practical jokes, the urging or daring of men to take needless risks and similar behavior that might result in an injury should not be indulged in.

13. Exercise every reasonable precaution in the handling, maintenance, inspection and repair of machinery, equipment, plant and tools.

14. Give the new man a willing and helpful hand. Through timely and friendly advice show him the safe way and the best plan for the proper performance of his tasks. Especially caution him on the hazards generally associated with his particular work.

15. Report at once to First Aid Room no matter how small a cut, scratch, bruise or splinter that you may have. Prevent infections by having every wound treated immediately with an antiseptic, and then having it covered with a sterile gauze bandage to keep it clean. Report all injuries at once to your foreman, so that proper treatment may be obtained. Obtain medical aid without delay if an infection begins to develop, being indicated by redness, swelling, soreness and a feeling of heat around the wound which gets gradually worse instead of better. A further delay of only one day may cause several weeks of painful suffering that might have been avoided. ERNEST DUTCHER, *Safety Engineer, Pioneer Div., The Flintkote Company.*

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## Placing Concrete Under Water

Concrete should not be deposited under water if practicable to deposit in air as there is always some uncertainty as to the results obtained from placing under water. The additional expense and delay of avoiding this method will be nearly always warranted. Where conditions are such that concrete must be placed through water, expert supervision is necessary and every precaution must be taken to prevent the cement from being washed out of the concrete. The formation of laitance on top of the concrete should be avoided. When it is impossible to avoid, it should be removed. A fairly rich mix, containing at least seven sacks of cement per cubic yard of concrete, should be used.

One successful method of placing concrete under water has been with the tremie. The tremie is usually a steel pipe or tube long enough so that the lower end will reach the bottom of the work when the upper end is above water level. A hopper is usually provided at the upper end to receive the concrete. When placing operations are to start, the lower end of the tremie is plugged to prevent the entrance of water or the escape of concrete. The tremie is filled with concrete and lowered into position. When the lower end reaches the bottom of the work, the plug is removed and the concrete allowed to flow out slowly. As concreting proceeds the lower end should be kept submerged in the concrete for several feet and the tremie kept constantly full of concrete.

Drop bottom buckets are also used for placing under water. The bucket should be of a type that cannot be dumped until it rests on the surface upon which the concrete is to be deposited. The bucket should be completely filled and slowly lowered to avoid back-wash. When discharged, the bucket should be withdrawn slowly until well above the concrete. The concrete should be disturbed as little as possible. *Design and Control of Concrete Mixtures (8th edition)*, PORTLAND CEMENT ASSOCIATION.

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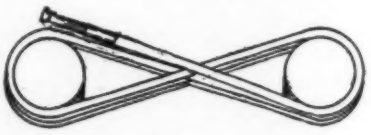
## How to Coil Hose, Rope, Cable, Wire, Etc., Without Making It "Kink"

The accompanying sketch shows how to coil hose, rope, wire, etc., so that there will be no "kink." That is, coil it in the form of a figure 8. The sketch shows how this writer coils his hose—over two metal cans 12 inches in diameter. By doing it in this way the "other end" of the hose, not visible in the sketch, can be permanently attached to the pressure water line making it unnecessary to attach and remove the hose every time it is used.



The reason why the old troublesome "kink" is eliminated is as follows: you first coil the hose around one can in one direction, and then coil it around the other can in the opposite direction. The kink that tends to form with the first turn is neutralized with the second turn, and as a result there isn't any kink at all. Not only is this method a time saver; it is a hose, rope, and cable saver.—W. F. SCHAPHORST, M.E.

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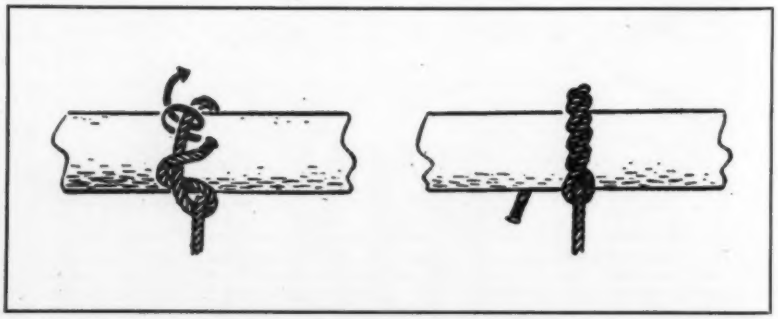
## The Timber Hitch

The timber hitch is a simple, convenient hitch which does not jam, and comes undone readily when the pull ceases. It is used mainly to tow or hoist cylindrical objects, such as logs, spars, etc.—also, in handling cargo, to hoist small crates and bales. It is used with one or more half hitches made with the standing part—for towing a spar or hoisting a timber on end.

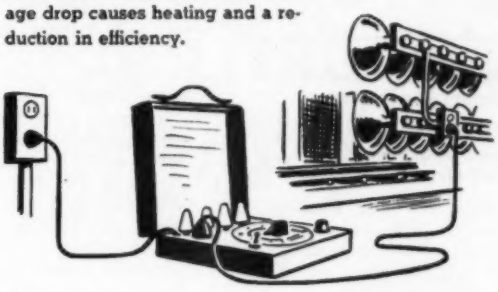
To Tie: Pass a rope around the object and take a turn with the end around the standing part. Then, as shown in the diagram, twist or turn the end back on itself. Three turns back are sufficient and they should follow the lay of the rope.—*Useful Knots and How to Tie Them,* PLYMOUTH CORDAGE COMPANY.



# To Prevent Interruptions in Electrical Service

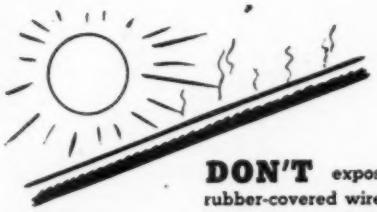
**DON'T** drag cords around sharp corners, or over rough objects. Cuts and bruises hasten deterioration of the insulation.

**DON'T** let voltage drop below normal rating—excessive voltage drop causes heating and a reduction in efficiency.



**DON'T** yank at portable cords to straighten out kinks—careful handling pays dividends in longer wire life.

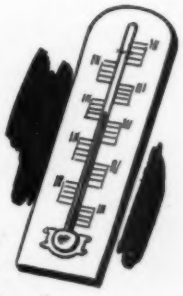
**DON'T** attempt make-shift wiring—even as a temporary measure. A make-shift is the weak link that may lead to a break-down of the entire electrical system.



**DON'T** expose rubber-covered wires and cables to direct sunlight. Wires or cables installed in sunny locations should always be shielded from direct rays.

**DON'T** leave high-voltage cables unprotected. Be sure to provide the kind of protection that eliminates the danger of accidental contact, which might result in serious damage and injury.

**DON'T** run cords or cables over drums or pulleys that are too small in diameter for the size of the cord or cable.



**DON'T** keep wires or cables stored where they will be exposed either to extreme heat or extreme cold, as extremes of temperature are harmful to insulations.

Adapted from material of Anaconda Wire and Cable Company.

# Convention Papers . . . Abridged

**Abridgments in this section are from papers presented at the Second Engineering Conference of the Technical Association of the Pulp and Paper Industry held in Philadelphia, November 3-5, 1947.**

## Steam Supply and Control Arrangements for Dryers

**G. H. YOUNG**
**Vice Pres. and Chief Engineer**
**Midwest-Fulton Machine Co.**

Steam supply to paper machines is usually exhaust or extraction steam. Reciprocating engines, with oil-contaminated exhaust, have been to a great extent supplanted by turbines with a resultant source of clean drying steam.

However, in mills still using exhaust steam from engines, steam purifiers should be used to eliminate the oil as much as possible, and chemical cleaning the exhaust piping and dryers from time to time is advisable.

In mills having bleeder turbines, if the process steam demand and electrical load are within the economical range of the turbines, there is no problem of steam supply and so far as the paper machine is concerned, the only problems are adequate piping and controls.

Figure 1 is a typical flow diagram in a mill using bleeder or extraction turbines. Usually, the extraction header is maintained at a constant pressure and controllers regulate the steam pressures on each individual machine.

The pipe lines from turbines to machines should be as short as possible, consistent with plant layout and design.

If pipe lines are too small, the turbines will be penalized with higher extraction pressures than necessary, or drying capacity will be lost by reason of the pressure drop.

Air operated controllers are accepted as good standard practice today, and the instrument is usually located on the front side of the machine convenient for the operators, while the steam control valves can be located in the piping on the drive side of the machine or in the basement.

Steam control valve sizes should be selected on the basis of allowable pressure drops and rangeability, to give good regulation.

Figure 3 illustrates a control arrangement using exhaust steam from a straight back pressure turbine supplemented with live make-up. One controller, panel mounted, on the front side of the machine convenient for the operators, automatically controls the exhaust steam and live make-up. With this particular arrangement, the steam pressure in the dryers will be the same as the back-pressure on the turbine. The back-pressure will vary up and down with the required drying pressures as set by the operator.

If a break occurs on the machine, it is not necessary for the operators to change the controller as the instrument will automatically shut off live steam make-up and open the atmospheric relief valve thus releasing the excess steam from the turbine exhaust to the atmosphere. When the sheet is brought over the dryers again, the controller will automatically shut off the exhaust steam valve to the atmosphere and again admit live make-up to build up the back-pressure to the desired drying pressure.

Figure 5 illustrates the complete dryer piping on a typical paper machine making the coarser grades of paper such as board, kraft, felt, etc.

Since the dryer sections on these machines are usually rather long, expansion joints should be provided in the steam and condensate headers to compensate for expansion and relieve stress on the steam joints. Steam lines will expand about 1 in. per 50 ft. of length from cold room temperatures to maximum heated temperatures; consequently, when expansion joints are not employed or expansion otherwise compensated for, the steam

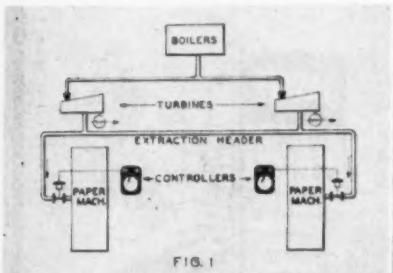


FIG. 1

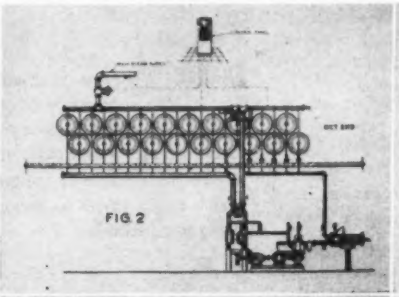


FIG. 2

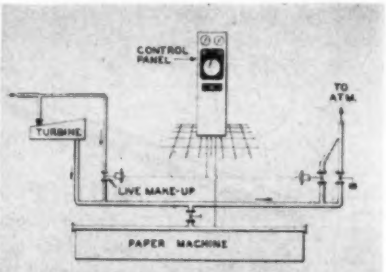


FIG. 3

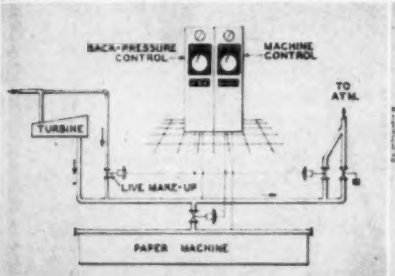


FIG. 4

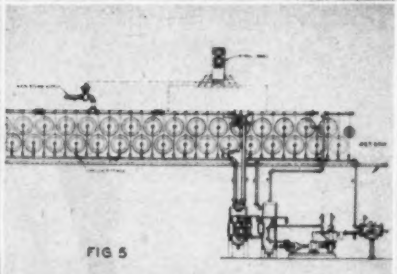


FIG. 5

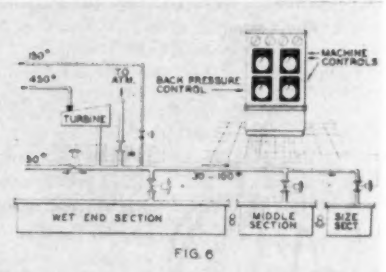


FIG. 6

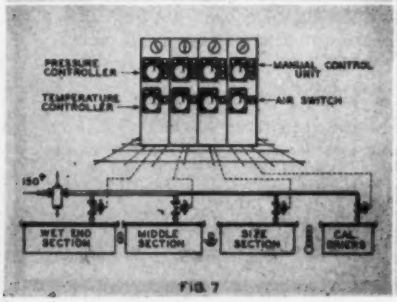


FIG. 7

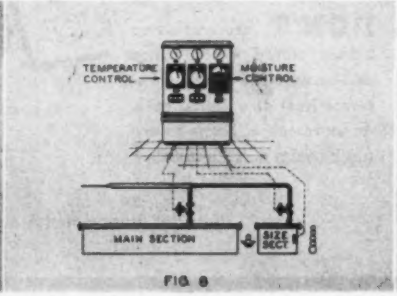


FIG. 8

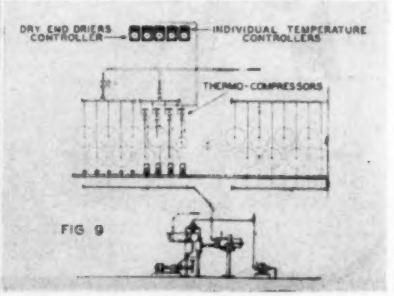


FIG. 9

UNION PACIFIC

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OFFICE OF THE GOVERNOR
SALT LAKE CITY

HERBERT B. MAW
GOVERNOR

To American Industry:

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The State of Utah prides itself on the quality of its people, the tremendous extent and ready availability of its raw materials, its unlimited power resources, its unequaled transportation facilities, and its friendly attitude toward business.

These factors, together with the advantages of living under ideal home surroundings in the nation's most interesting area, has already induced many fine industries to locate in our State.

A new industrial economy is developing in our commonwealth based on the substantial foundations of the basic materials available and the happy and contented people constituting the human resources.

The establishment of your business in Utah will give you an opportunity to share in this new industrial economy and to participate in the growth already experienced in the west.

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Governor

Herbert B. Maw

* *One of a series of advertisements based on industrial opportunities in the states served by Union Pacific Railroad.*

**Unite with Union Pacific in selecting sites and seeking new markets in California, Colorado, Idaho, Kansas, Montana, Nebraska, Nevada, Oregon, Utah, Washington, Wyoming.**

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## UNION PACIFIC RAILROAD

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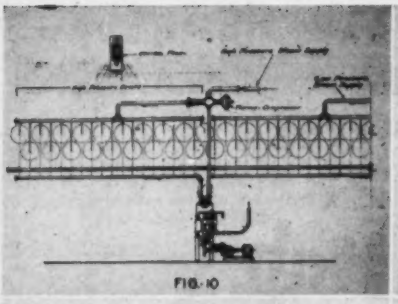


FIG. 10

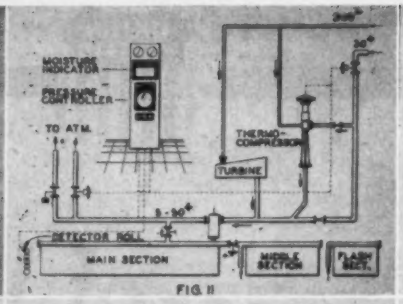
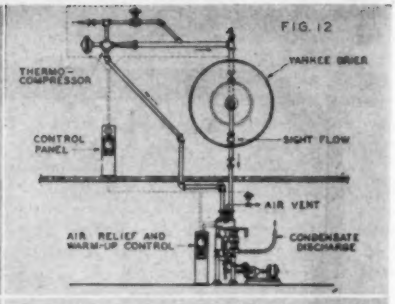



FIG. 11



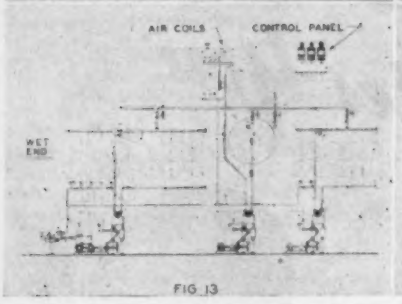
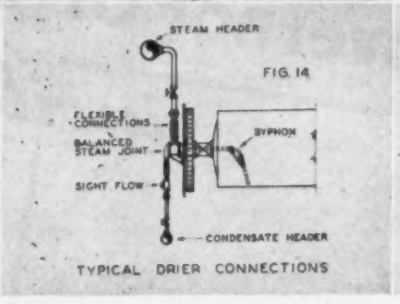
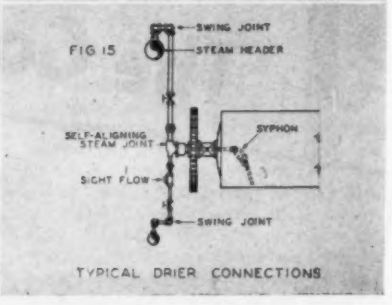




FIG. 13




TYPICAL DRIER CONNECTIONS




TYPICAL DRIER CONNECTIONS

joints can be thrown several inches out of line or even broken off.

Figure 6 illustrates a steam supply and control arrangement for a paper machine equipped with a size press and a smoothing press, or in other words, with the dryers divided into three sections. The steam supply to each dryer section is separately controlled. Thus, the machine tender can regulate the steam pressure in each section to give the desired moisture content in the sheet at the smoothing press, at the size press, and in the finished sheet at the dry end.

On this particular installation, the steam supply is shown from three sources, that is, low pressure extraction steam, exhaust steam from a drive turbine, and 150 lb. live make-up steam. One back-pressure controller instrument regulates the back-pressure on the turbine admitting and exhausting steam to and from the various sources to keep a sufficient head of steam for the drying operation at all times.

Figure 9 illustrates a method of individually controlling dryers following a coating or sizing operation, or at the extreme wet end of the machine. In this illustration, thermo-compressors are utilized for reducing and controlling the temperature of the dryers and at the same time, creating a circulation of steam through the dryer, thus maintaining uniform crosswise temperatures and aiding in the evacuation of condensate and non-condensible gases. On some paper machines, making very fine grades of paper, each and every dryer is individually controlled throughout the entire machine.

Figure 10 illustrates a method of controlling the steam supply to a section of high pressure dryers on the dry end of a paper machine utilizing a thermo-compressor to reduce the high pressure steam down to the desired drying pressure and at the same time, the thermo-compressor creates a circulation of steam through the entire high pressure section of dryers to promote the removal of condensate and noncondensible gases.

The thermo-compressor is actuated by means of an air operated controller conveniently located on a panel board on the front side of the machine. The high pressure dryers could be the conventional cast iron type or steel welded dryers in which pressures up to as high as 150 lb. or even higher can be carried.

Often it is desired to increase the drying capacity of a paper machine by increasing the steam pressures in the dryers. To do this, it is sometimes difficult to work out a proper steam balance. Figure 11 illustrates one method. The turbine driving the machine is capable of exhausting against 50 lb. pressure, but the only other source of low pressure steam supply is 30 lb. Therefore, a thermo-compressor is utilized to boost the 30 lb. steam up to 50 lb. pressure to supplement the exhaust steam from the turbine, thus making it economically feasible to raise the pressure on the machine dryers from 30 lb. up to 50 lb. and consequently, increase the drying capacity of the machine.

The Yankee, or single dryer machine, is coming into more frequent use in the paper industry and this type of dryer requires special treatment from the standpoint of steam supply and condensate removal.

Usually, these dryers operate in the upper ranges of steam pressures, that is, from 0 up to 125 lb., or even higher.

Figure 12 illustrates a typical steam supply and control arrangement for a Yankee dryer.

Figure 14 illustrates the typical individual connections to a dryer equipped with a balanced type steam joint. Since this type of steam joint is usually anchored to the frame, gear guards or covers, the pipe connections from the headers can be made with a minimum number of joints and flexible connectors can be used to compensate for expansion.

Usually, with this type of steam joint, a revolving syphon or extractor is utilized for removing the condensate. These devices are very excellent especially on high speed machines and the revolving syphons in combination with the balanced steam joint will materially reduce the power required for driving a section of dryers.

Figure 15 illustrates typical connections to an individual dryer using a self-aligning type of steam joint and with swing joints in the piping to compensate for expansion. Improved type flexible syphons are available for these steam joints, which reduce the over-hung load on the joint; consequently, the syphons remain in proper position and last longer.

## Flow Meters in the Paper Industry

**CLAYTON H. BARNARD**
**Application Engineer**
**Bailey Meter Company**

The value of flow meters to the pulp and paper industry has long been widely recognized. Today, accurate flow metering equipment is employed on steam, water, chemicals, black and green liquor, liquid and gaseous fuels, and other miscellaneous fluids.

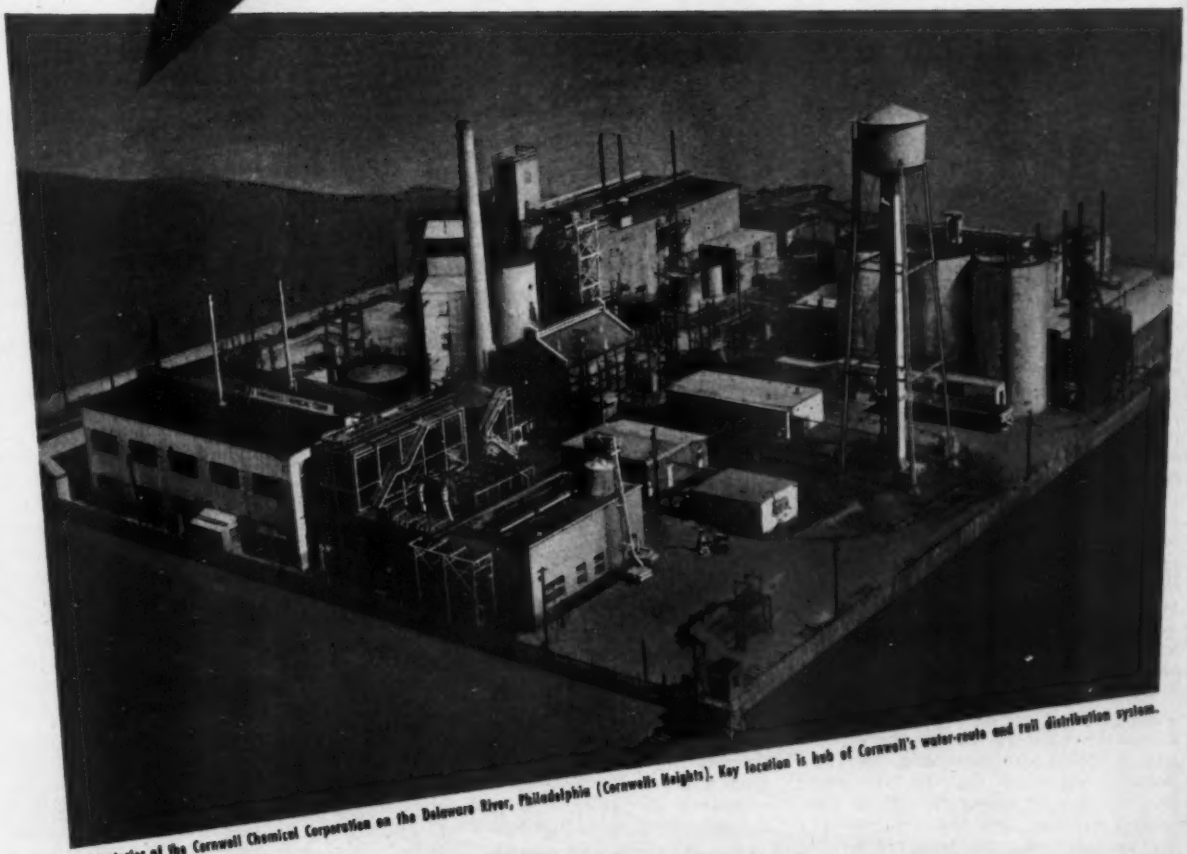
As in any type of instrument, there are two different types of accuracy to be considered: initial accuracy, and sustained accuracy. The initial accuracy is dependent upon the inherent design of the equipment by the manufacturer, and to no less degree upon the installation.

Sustained accuracy is a function of proper instrument maintenance, and here the manufacturer can do little once the design has been established except provide an adequate staff of competent engineers available for field service. It is largely up to the purchaser to provide the necessary maintenance which will insure a high sustained accuracy of the instrument.

In general, installations should be made in the simplest possible manner consistent with accepted engineering practice. If a simple mechanical meter of the inverted bell type can be used, there is no justi-

# SALT CAKE

.....paper makers' grade



Plant and Laboratories of the Cornwell Chemical Corporation on the Delaware River, Philadelphia (Cornwells Heights). Key location is hub of Cornwell's water-route and rail distribution system.

**Cornwell Chemical Corporation**

CORNWELLS HEIGHTS (PHILADELPHIA), PA.

Telephone: Torresdale (Phila.) 4-7358 Cornwells 0302 Cables: SEECHEM

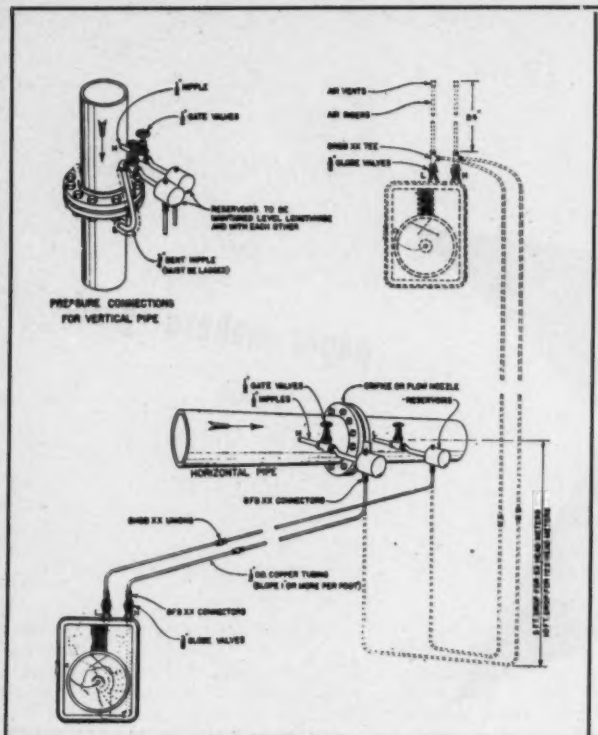



Figure 3

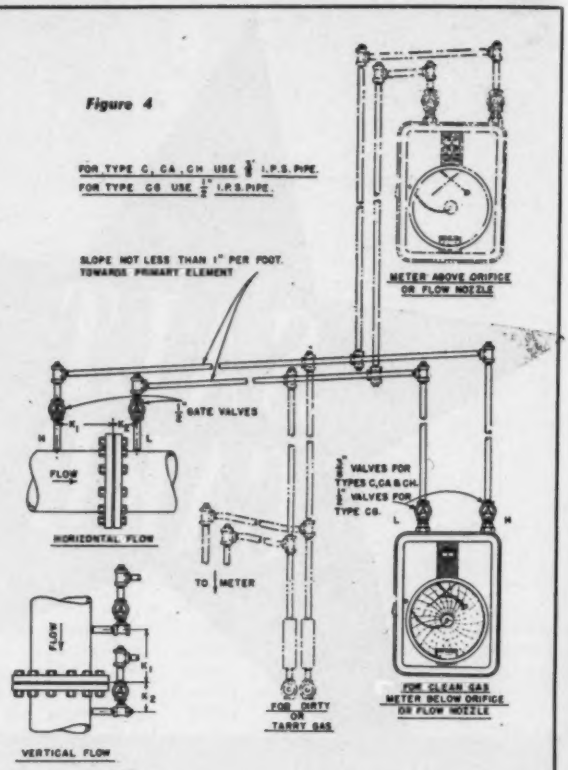

FOR TYPE C, CA, CH USE ½" I.P.S. PIPE.
FOR TYPE CG USE ¾" I.P.S. PIPE.
SLOPE NOT LESS THAN 1" PER FOOT TOWARDS PRIMARY ELEMENT
METER ABOVE ORIFICE OR FLOW NOZZLE
½" GATE VALVES
FLOW
HORIZONTAL FLOW
TO METER
FOR DIRTY OR TARRY GAS
FOR CLEAN GAS METER BELOW ORIFICE OR FLOW NOZZLE
VERTICAL FLOW

Figure 4

fication for using remote reading types of flow meters. Only when the distances involved are too great, or the materials to be handled are of a special nature, should such equipment be considered.

In selecting a location for the instrument, the recording mechanism should be situated so that it is of maximum value to the operators who have to use it. There is increasing tendency towards centralized control where all insruments are mounted on a panel board, together with the control equipment, for an entire process. Once the instrument's location is selected, the location of the primary element, orifice or flow nozzle, should then be considered. The location selected for the primary element should be accessible for periodic maintenance, and at a point in the system where shutting down the main line will not cause difficulty with the meter. For example, a shutoff valve in a steam line should follow rather than precede a steam orifice installation in order to keep a positive head on the meter at all times, even when the line is shut off.

Needless to say, the primary element should be installed in the piping in strict accordance with the manufacturer's recommendations, with care being taken to center it carefully in the pipe, make sure that the flow is passing through in the proper direction, and that the pressure taps are taken off at the prescribed points.

**Steam and Water Meters**

For accurate metering of steam and water, it is desirable wherever possible to have the meter located below the main line. This will insure a positive head on the meter, even when the line is out of service. In cases where steam lines may be subjected to vacuum when out of service, and this should be avoided wherever possible, a suitable vacuum breaker should be provided to prevent drawing water out of the connecting piping and spilling mercury from the meter.

The desired method of installing connecting piping for steam and water meters is illustrated by Figure 3. The connecting piping should slope as indicated, to permit entrained air to escape without entering the meter body, and where necessary, suitable air vents should be provided.

In cases where it is necessary to measure flow of steam in vertical lines, the bent nipple should be thoroughly lagged to prevent condensation from creating a false head.

Where water temperatures are below 250 Fahr., the reservoirs need not be installed since the error created by temperature differential will be insignificant.

**Gas and Air Flow Meters**

With gas and air flow meters, it is desirable to locate the meter above the line, in order that condensation and solids may drain back into the line and not enter the meter body. Figure 4 illustrates the desired arrangement. Where the gas is very dirty, droplegs with blowoff valves should be installed as illustrated.

**Accessories for Special Purposes**

When measuring the flow of oils or certain chemicals, which should not be allowed to enter the meter, separating chambers, as illustrated by Figure 5, can be used to good advantage. Special attention should be paid to the elimination of leaks with a system of this kind in order to prevent undue maintenance caused by the loss of water from the system.

Where corrosive gases are to be measured, it is frequently necessary to install a purge system where air or gas is continuously bled into the connecting lines through an orifice in such a manner that the proper differential is applied to the meter body, but the gas being metered is not allowed to enter it.

Where liquids or steam carry considerable quantities of solids, it is desirable to install settling chambers as illustrated by Figure 6. These can be drained at periodic intervals, thereby preventing undue amounts of sediment from collecting in the meter body.

**Maintenance**

Routine maintenance varies greatly, depending upon the individual installation, the type of instruments, and the type of fluid being metered. There are general points which should be thoroughly checked periodically, which are common to practically all flow meters, and which are outlined below:

1. The connecting piping should be blown out at periodic intervals in order to prevent foreign materials from entering the meter body. The time element can be determined only by actual experience, but should be sufficiently often to prevent serious trouble from developing.

2. The meter and piping should be periodically checked for leaks and steps taken to remedy any leaks which are found. Especially in high temperature

# Why

No single type of dryer felt will meet the needs of all mills. But HOOPERWOOD "Canvas Engineering" has the answer to that problem—a specific HOOPERWOOD Dryer Felt for each requirement.

If it is a rugged, heavy felt you need for fine finish in normal production . . . or a lightweight, extra-porous felt for faster drying . . . or an Asbestos Felt to withstand advanced temperatures in high speed production of Kraft and other heavy papers—there is a HOOPERWOOD felt to fit your need.

Mill Superintendents find this service invaluable in suiting the particular requirements of their mill—even down to each machine position if desired.

Make your next felt *right*—specify HOOPERWOOD.

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Mills: WOODBERRY, BALTIMORE, MD.

# Engineered

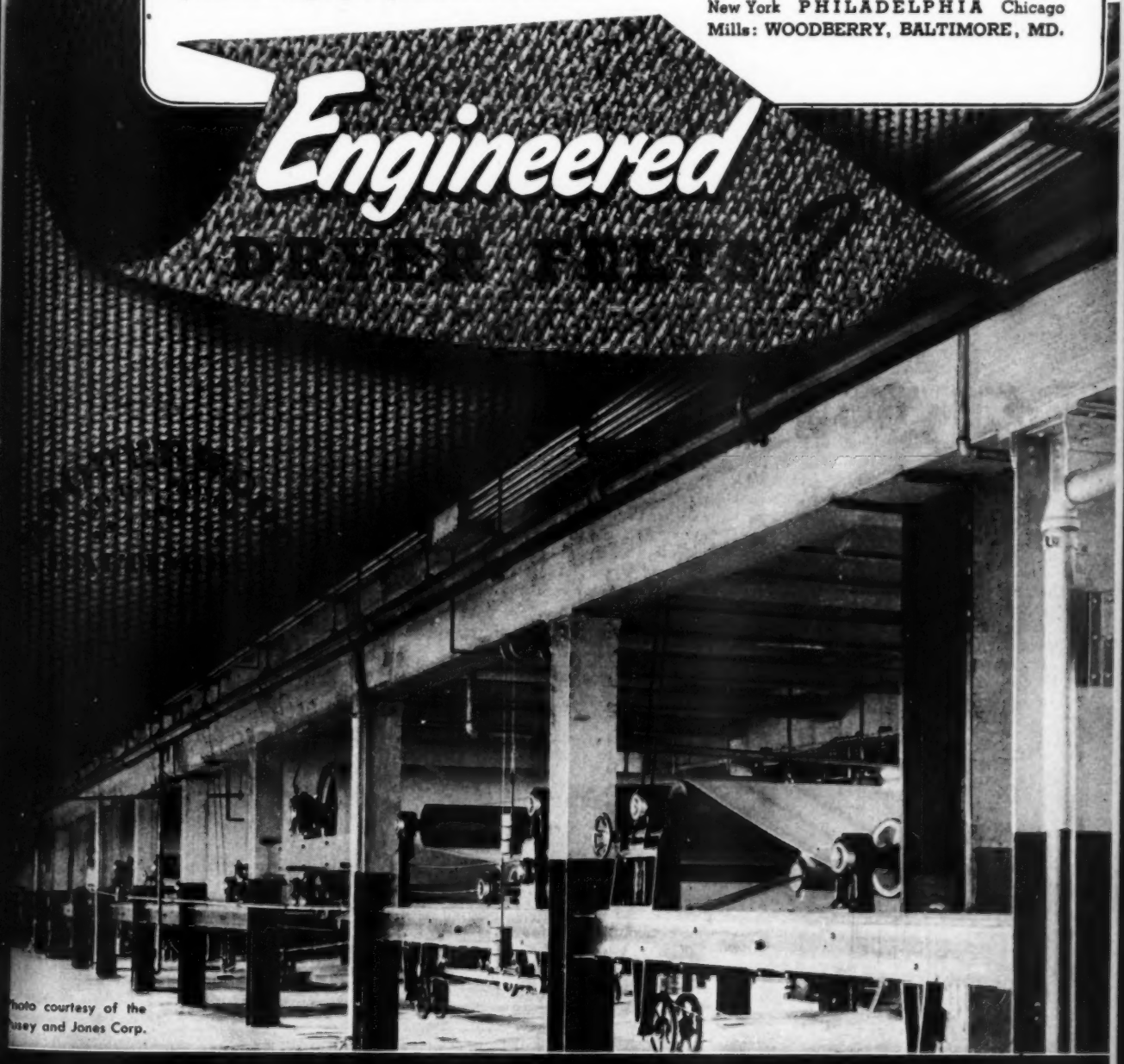


Photo courtesy of the Busey and Jones Corp.

## HOOPERWOOD DRYER FELTS

### COTTON AND ASBESTOS

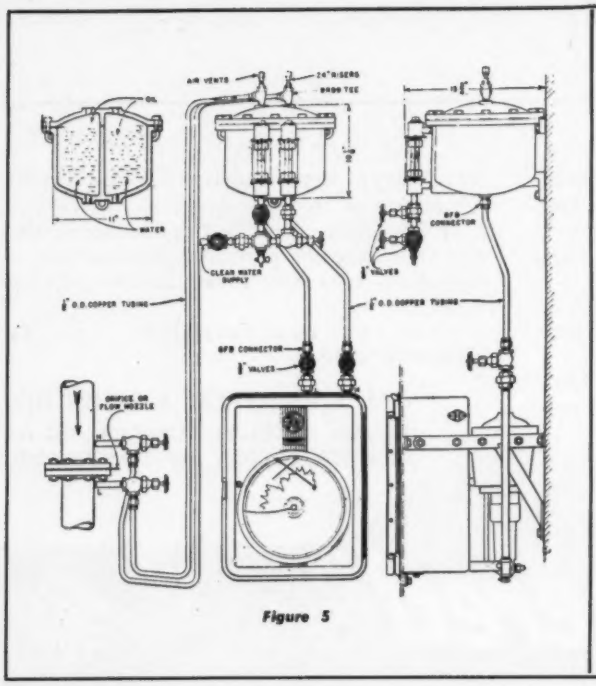



Figure 5

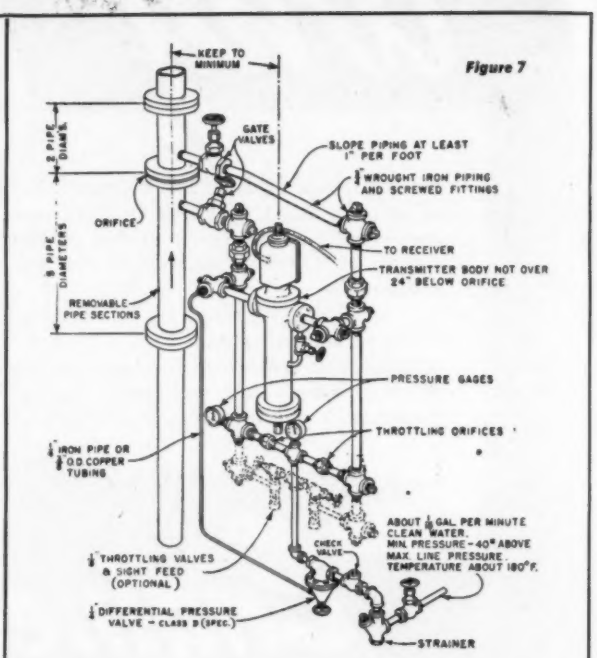

KEEP TO MINIMUM
GATE VALVES
SLOPE PIPING AT LEAST 1" PER FOOT
WROUGHT IRON PIPING AND SCREWED FITTINGS
ORIFICE
TO RECEIVER
TRANSMITTER BODY NOT OVER 24" BELOW ORIFICE
REMOVABLE PIPE SECTIONS
PRESSURE GAGES
THROTTLING ORIFICES
IRON PIPE OR O.D. COPPER TUBING
ABOUT ½ GAL. PER MINUTE CLEAN WATER. MIN. PRESSURE - 40" ABOVE MAX. LINE PRESSURE. TEMPERATURE ABOUT 180°F.
CHECK VALVE
THROTTLING VALVES & SIGHT FEED (OPTIONAL)
DIFFERENTIAL PRESSURE VALVE - CLASS D (SPEC.)
STRAINER

Figure 7

steam or liquid measurements, leaks can cause a considerable error in the meter reading, as well as bring undue quantities of foreign material into the meter body.

3. Purge systems used on various installations, and separating chambers as described previously, should be checked at periodic intervals to insure satisfactory operation.

4. The meter itself should be checked, preferably by water column, after it has been thoroughly cleaned. Generally, once a year is sufficient for this purpose, although where the service is unusually severe, more frequent checks may be advisable. For flow meters equipped with integrators, the integrator should be carefully checked and adjusted each time the meter is cleaned.

5. The primary element installation should be checked occasionally, both internally and externally. Externally, it should be checked to insure that the reservoirs are absolutely level as strains on the connecting piping over periods of time may move them from their original position, creating a false differential and giving a false flow reading. Rather infrequent internal inspections, probably at five year intervals or so, should be made to insure that no damage has come to the primary element, or that no undue deposits are being built up, which would cause inaccuracies. This is a point which is very often neglected, and while it is a nuisance item, it can generally be justified by the increased sustained accuracy of the equipment.

6. At periodic intervals the instrument engineers should review the chart records from the various instruments. A properly trained man can often detect from meter records any troubles which may be developing, and have them corrected before serious errors are introduced.

Other routine maintenance includes maintaining a proper ink supply in the pen, checking of the chart drive mechanism, and adjusting when necessary, and a general visual inspection which will oftentimes point to elimination of trouble before it arises.

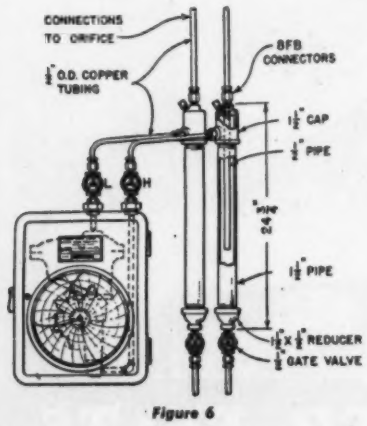



Figure 6

**Special Paper Mill Problems**

As far as flow measurements are concerned, probably the most common problem encountered in the paper mill is the measurement of black liquor flow. Ever since the introduction of recovery boilers, this has been a problem facing instrument manufacturers and users alike.

One type of installation which has been used in recent years with very good results is illustrated by Figure 7. A differential bellows transmitted is connected as shown, with hot water being used to purge the connecting lines and prevent the black liquor from actually entering either the connecting piping or the meter body. The lines are made as short as possible and with sufficient unions for ready maintenance in the event that an occasional plugging does take place.

The bellows transmitted shown in cross section in Figure 8 is connected electrically to an electronic recorder, which can be located at almost any convenient distance from the point of measurement. This is not an electrical meter in the usual sense, but a mechanical meter, with its inherent high accuracy, upon which is superimposed a very high accuracy telemetering system. The fluid being measured or the water, does not come in contact with any of the electrical equipment.

Installations of this type have been far superior to some of the earlier installations where long connecting lines were used.

One of the newer developments for black liquor flow is the area meter as illustrated by Figure 9. This meter is essentially similar to a single seat valve, held closed by either a spring or a weight, de-

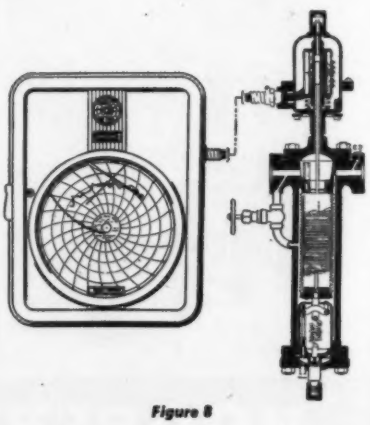
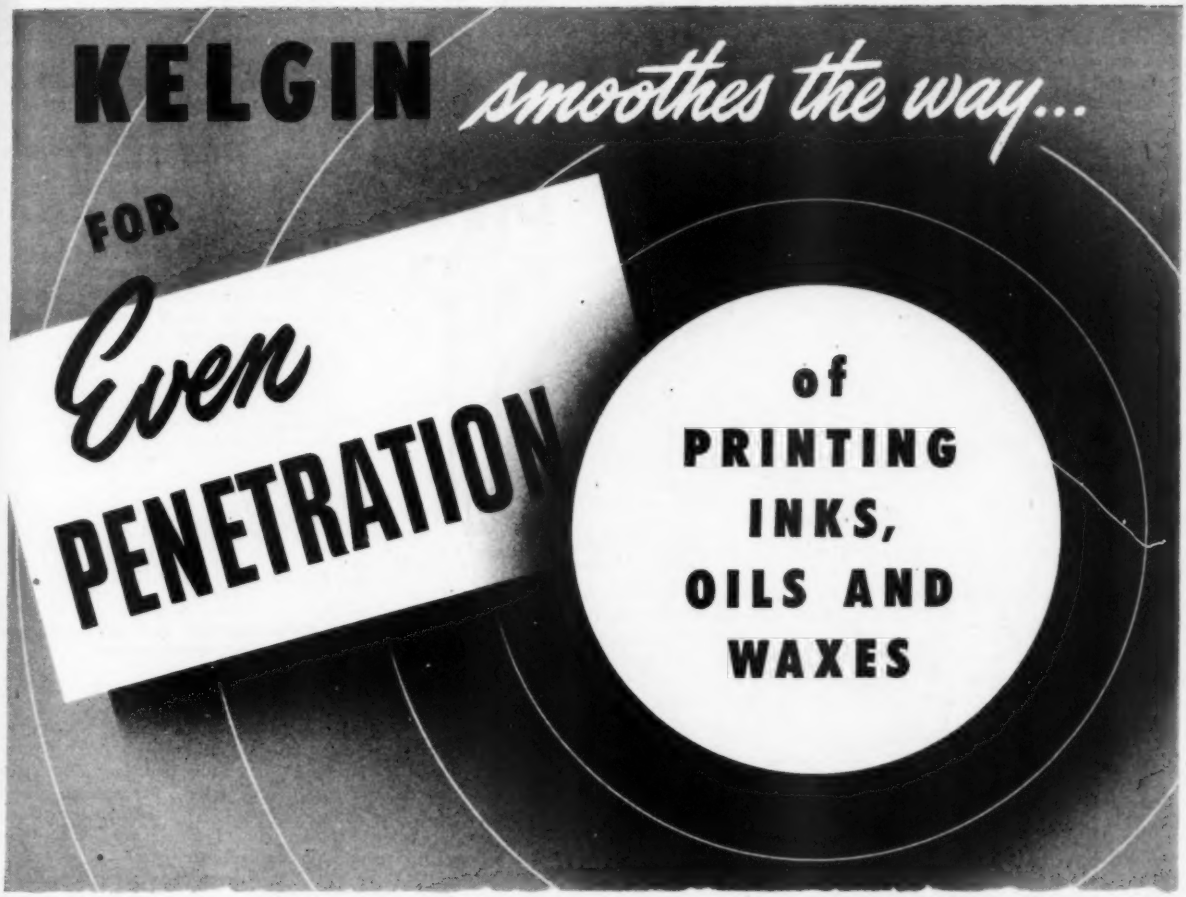


Figure 8

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pending upon the capacity to be handled. As the fluid passes through the body, the plug lifts, uncovering properly designed ports, to permit the liquid to pass through and maintain a constant pressure drop depending upon the spring setting or the weight loading. The more flow, the greater the lift, and vice versa. The lift of the plug is measured by the same high accuracy recording electronic telemeter illustrated previously.

This meter has the obvious advantage that no connecting piping of any type is required since it is installed directly in the pipe line. The black liquor or other fluid to be measured does not come in contact with any of the moving parts except the plug and seat ring, and experience has proven these to be largely trouble-free.

Preliminary experience in the application of this meter to heavy black liquor flow measurement indicates that it will be the best meter for the service so far developed.

After having solved the difficult problems presented by black liquor flow measurement, the measurement of green liquor flow becomes very easy, utilizing the same principles used for black liquor. A bellows type of transmitter has been used with complete satisfaction, and using the same hookup as shown for black liquor except that hot water is not required for purging in this instance.

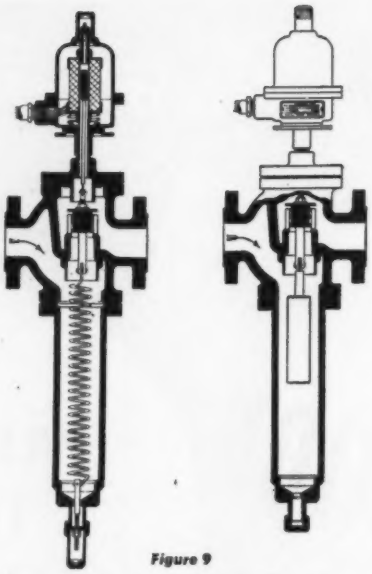


*Figure 9*

While no area meter installations have as yet been made on green liquor, there is no reason to believe that the results will not be entirely satisfactory.

## "Case Study"—Short Circuit Analysis of a 40,000 kv.-a., 2300 volt Power System on an "a-c Network Calculator"

**E. L. COWAN[1] and W. V. KNIGHT[2]**

The rapid expansion of the power system in Gaylord Container Corporation's Bogalusa Mill over the past few years has presented many problems in the distribution system; such as proper selection of new generator voltages, proper type of cables, proper selection of circuit breaker arrangements, feeders, and buses to insure flexibility and continuity of services.

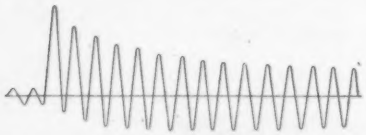


*Fig. 1—Typical short circuit secured from a generator*

Regardless of the thoroughness of design, construction, and maintenance, the electric system will occasionally be subjected to faults or short circuits. When this occurs, the currents in the parts of the circuit between the power source and the fault locations rise to many times their normal values. It is vital that such faults be isolated from the system and that the parts not directly involved be essentially undamaged by the fault. This is the function of the circuit breakers, and in order to select breakers of proper size and type, it is necessary to have an accurate knowledge of the magnitude of the fault currents.

This paper will deal primarily with the method used to obtain the magnitude of fault currents throughout a distribution system. There are two ways of obtaining this information: (1) The information could be calculated by a rather long and complicated procedure, or (2) the distribution system could be set up in actual miniature replica on an a.-c. Network Calculating Board and the results tabulated from readings made on indicating instruments. In this case, the use of the Calculating Board was decided upon due to the complexity of the power system, and the impracticable mathematical calculations necessary to obtain all the information needed.

*Fig. 3—Typical short circuit current secured from an induction motor*

The information required from the Calculating Board study was:

1. Determination of maximum short circuit values for circuit breaker interrupting duties under future operating conditions with the addition of a new turbine generator, synchronous motors and induction motors.

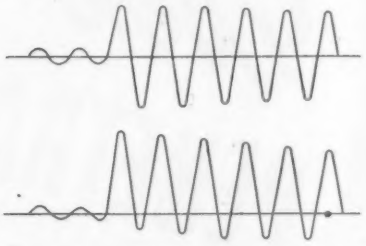


*Fig. 4—Symmetrical and unsymmetrical short circuit current*

2. Bus voltage during short circuit at a point remote from fault location to give a measure of system performance under fault conditions, such as dropping of important motor loads, motor driven generators, exciters, etc.

3. Studying voltage at various loads with alternate methods of handling load; that is, with a turbine out of service, emergency lines in operation, and reactors shunted by breaker to tie bus sections together.

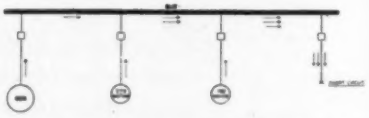
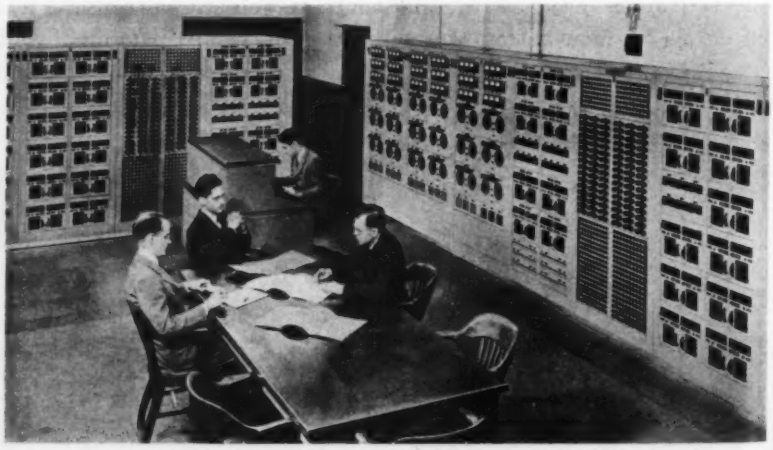


*Fig. 5—All generators, synchronous motors and induction motors produce short circuit current*

*Figure 8 (below)*



(1) Asst. chief engineer, Gaylord Container Corp., Mill Division; (2) chief electrician, Gaylord Container Corp., Mill Division.

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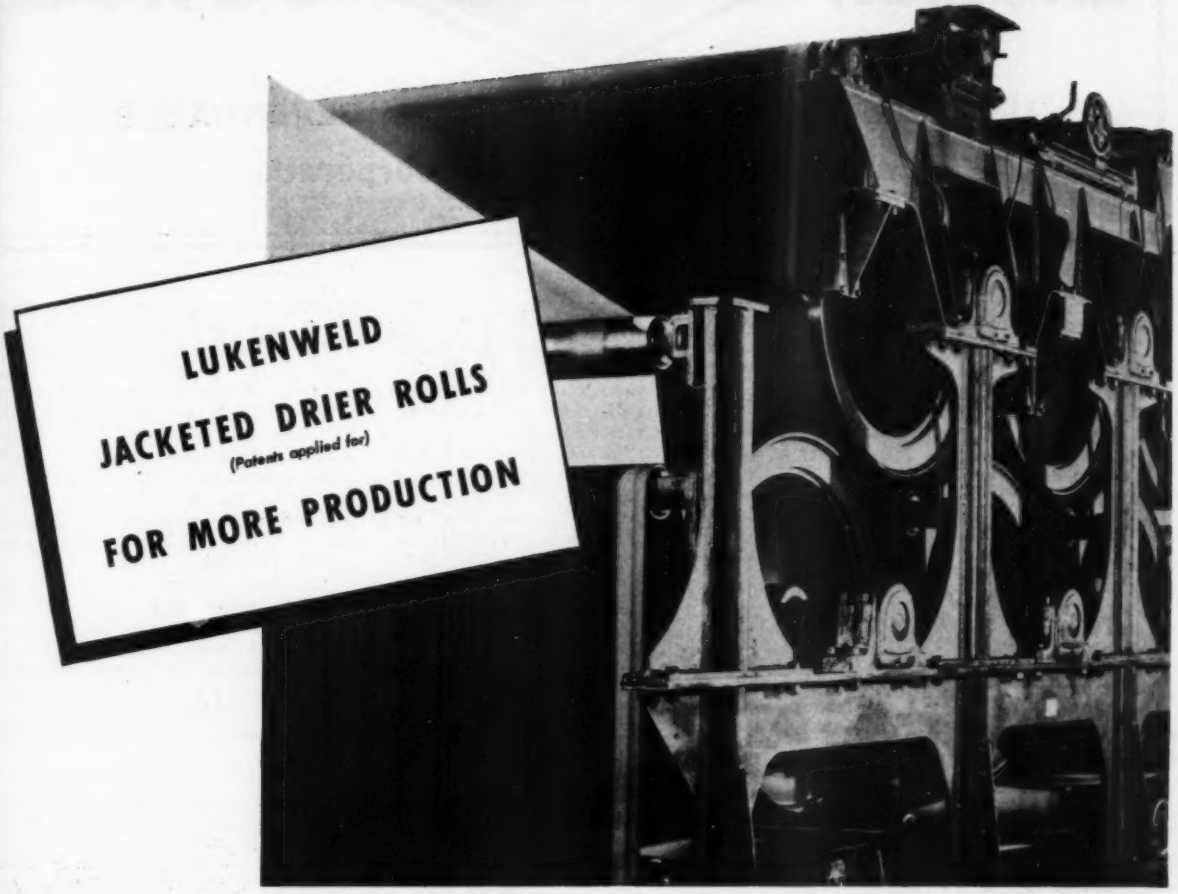


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4. Information necessary to co-ordinate relaying and protective equipment.

The study of the short circuit values was the most important in this case study. This was due to the large amount of existing equipment in service and the relative low voltage of 2,300 volts for a system of 40,000 kv.-a.

Figure 1 shows a typical short circuit on a synchronous generator as recorded by an oscillograph.

The current shown is that in one phase of the 3 phase current. The corrent on the left side of the diagram is the

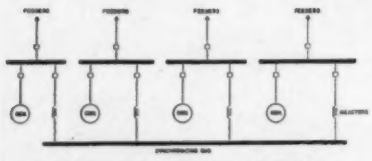

***Fig. 9—Typical synchronizing bus arrangement***

normal full load current of the generator, and the high value on the right is the current obtained under short circuit conditions.

The extra energy required to produce the high short circuit current does not come from more steam being admitted to the turbine but comes from the inertia of the rotating field and turbine rotor.

At the instant of sudden short circuit, the demagnetizing effect of the armature currents tends to decrease the flux linkage with the field winnings. However, the flux linkages within any inductive circuit cannot be changed instantaneously but tend to remain constant. Actually, the change in these flux linkages, instead of remaining constant, follow a time period depending upon the time constant of the circuit, which is the reason for the decay of armature current.

Synchronous motors are constructed similar to generators and produce short circuit currents in exactly the same manner. The energy stored in the rotating parts of a synchronous motor is usually somewhat smaller than that of a generator, therefore, the short circuits will by correspondingly less. The amount of the short circuit current supplied, or pumped back, from a synchronous motor is dependent upon the impedance of the motor. When the voltage drops, due to the short circuit, the motor stops delivering energy to the mechanical load and starts to slow down. The inertia of the motor and load tends to drive the motor and, as a result, delivers power to the system.

It must be remembered that induction motors also produce short circuit current in the same manner, but the period of time that they will produce short circuit current is much less than that for generators or synchronous motors.

Figure 3 is an actual oscillogram of an induction motor operated under full load with a sudden short circuit placed on the feeder to the motor.

Figure 4 shows an "offset" or unsymmetrical short circuit and also shows a symmetrical short circuit.

Whether the short circuit is symmetrical or unsymmetrical depends on the point of the voltage wave at which the short circuit occurs. If the short circuit occurs at the peak of the voltage wave, the current is symmetrical with respect to the zero line; if the short circuit occurs at the zero point of the voltage wave, it is unsymmetrical.

Even though the short circuit current is initially unsymmetrical, it will normally become symmetrical in about five to ten cycles from the occurrence of the short circuit.

Air circuit breakers rated at 600 volts and below have an extremely fast interrupting time of from one cycle to two cycles, and therefore, allowance must be made so that the breaker will have the ability to interrupt unsymmetrical current.

The first half cycle of current can be 1.73 times the symmetrical value. However, since the low voltage air circuit breakers open the circuit in from one to two cycles, the A.I.E.E. and the Manufacturer's recommendations are that a factor of 1.25 can be used in selecting the proper size breaker.

Whenever several generators, synchronous motors, and induction motors are connected to the same bus, as shown in Figure 5, they will all simultaneously produce short circuit current. The total initial current is the sum of the currents produced individually by the generators, the synchronous motors, and the induction motors.

Therefore, in calculating the total initial short circuit current, it is necessary to consider the generators, as well as all motors in the mill.

Figure 8 shows a typical short circuit calculating board, or a.-c. Network Analyzer. You will note this is made up of many duplicate units, each unit representing a generator, a motor, etc., all of which can be connected in the proper manner to duplicate the actual system.

Since the voltage used on the Network Analyzer is very low, the actual currents

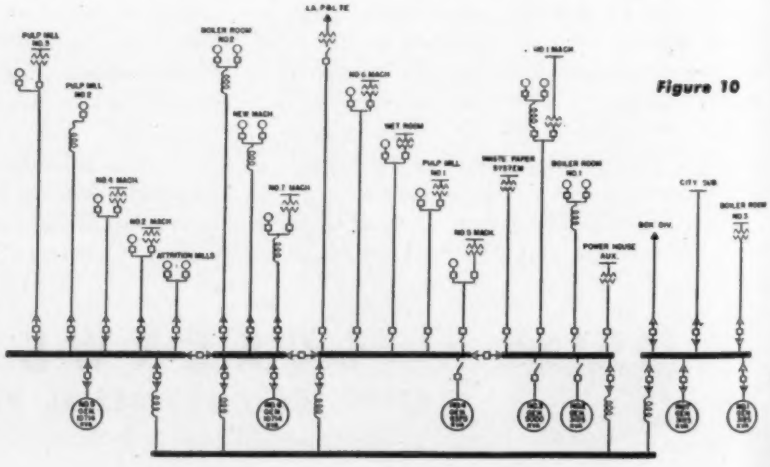

***Figure 10***

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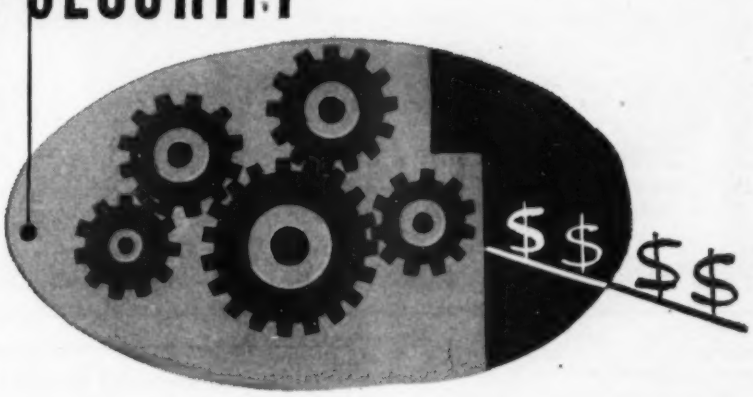

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secured are low, but are very accurate in direct proportion.

While, in the past, many schemes have been used for the arrangement of current limiting reactors, the "synchronizing bus" scheme generally is the most economical and flexible for a paper mill distribution system.

Figure 9 shows the general arrangement of the synchronizing bus scheme.

Utilizing this method, the synchronizing bus provides a tie between all generators and also provides a path for flow of power where needed.

Figue 10 shows the distribution system in the Gaylord Mill, and you will notice that the synchronizing bus arrangement has been used.

With all due respect to mathematical solutions of problems in complicated distribution systems, it is the author's opinion that the a-c Network Calculator will be used to an advantage in simplifying many of the electrical problems encountered by engineers in the pulp and paper industry.

**Acknowledgment**

To Gaylord Container Corporation for Permission to present these present data.

To Westinghouse Electric Corporation for pictures and information on the a-c Network Calculator used in making this study.

To General Electric Company for Oscillograms and other information.

The following abridgments are from papers presented at the annual meeting of the **Technical Section of the Canadian Pulp and Paper Association,** held in Montreal, Quebec, January 28, 29, 30, 1948.

## Slime Control at the Anglo-Canadian Pulp and Paper Mills Limited, 1947

**E. L. NEAL[1] and S. F. JENNINGS[2]**

The closing of the white water system in January, 1946, was accompanied by a very substantial increase in system temperatures. The resulting improved drainage characteristics of the paper machine furnish made increased speeds possible, but due to a very rapid deterioration of an already serious slime condition, no increase in production was obtained. Furthermore, paper that was made contained many slime holes and spots, and was, generally speaking, weaker. It was soon realized, therefore, that unless slime was brought under control, it would be necessary to reopen the system and modify speed-up plans.

By making use of different toxicants and combinations of toxicants, together with a determined drive for general system cleaning, a degree of control was finally obtained. This control was maintained and improved during the greater part of the year.

Since it was realized that the surface had hardly been scratched and that much more remained to be done than had been done, it was decided to plan slime control work during 1947 along the following lines:

(1) Vary toxicants and methods of application, recording at the same time in as accurate a way as possible the changes in quantity, character and effects of slime in groundwood, sulphite and paper mill systems.

(2) Observe and record carefully seasonal variations and determine, if possible, to what extent the pattern of slime formation repeats itself.

(3) Study carefully the economics of slime control in order to determine as closely as possible the point in treatment at which additional treatment ceases to show a profit, i. e., establish a point of diminishing returns.

This paper will deal, therefore, only with the work done during 1947. In order to present as clear a picture as possible (of a very cloudy problem) it is proposed to discuss the work done under separate headings.

**Water Supply**

The major source of infection to the Anglo mill is the water supply which is pumped from the St. Charles River, a sewage disposal outlet for Quebec City. This water is heavily polluted with indus-

(1) Assistant General Superintendent; (2) Mill Chemist, Anglo-Canadian Pulp and Paper Mills Limited.

trial and human wastes and is in consequence high in organic matter content. Bacterial colony counts done on samples of this water run from 30 to 50,000 colonies per cc., and average approximately 35,000 colonies per cc. To control this source of infection, rather heavy and widespread usage of chlorine is made.

**Chlorination**

Prior to 1946, incoming water was chlorinated at the pump house. During this time it was not possible to secure higher than 0.2 to 0.5 ppm residual over short periods with a chlorine treatment of approximately 700 pounds daily. In 1946 a Paterson chloronome was installed and 500 pounds of chlorine were added daily ahead of the pressure filters. With this total usage of 1,200 pounds daily it was possible to carry a residual of approximately 1 ppm. It was found that, during periods of low chlorine residual and during chlorine additions, there was a rapid build-up in fresh water slime and that greater use of costly toxicants was necessary to maintain control.

Early in 1947 chloronome capacity was increased and the chlorine addition before filters stepped up to approximately 800 pounds daily. This increased the total chlorine usage to approximately 1,500 pounds daily and enabled carrying a residual of 1 to 1.5 ppm. During periods when high residuals were carried, the best and most economical slime control was obtained. It was also noted during these periods that slime build-up in both sulphite and groundwood mills was reduced. It was decided, accordingly, to have a separate addition point for chlorine to the sulphite filtrate system. A small, packed absorption tower was constructed of 12 in. pipe and chlorine was metered to it through a flowrator at the rate of 10 pp/hr. Further reduction in the slime build-up in the sulphite mill resulted.

In order to carry chlorination a step further, it was decided to use chlorinated water on log-hauls, drum barkers and in the wood room; in short, throughout wood handling operations. As a result of this last mentioned step, colony counts at the grinders, usually quite high on the start-up before system temperature had sufficient time to come up to normal, were reduced to zero. Prior to this it was quite normal to have counts at the grinders as high as 200,000 colonies per cc.

To cut down periods of chlorine dosage and make it possible to carry 1 to 1.5 ppm residual at all times, additional equipment is being installed at the pump house. Experience to date indicates that the cost involved will be money well invested and will show ample returns in lower toxicant costs. Infection of the mill systems will then be totally air-borne.

**Toxicant Evaluation**

Before using any toxicants on a mill scale they are first checked in the laboratory according to methods developed by Glen King and if found promising they are given a trial run. Accurate evaluation of the effectiveness of the toxicant in the mill has been, in the past, a real problem. The number of slime breaks on the paper machines varies too much with the


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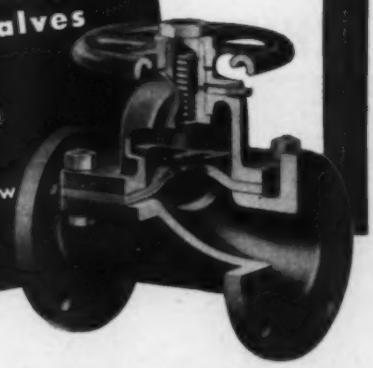

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amount of slime in the mill, and with the ability of machine crews to identify a break as such, to be used as a reliable guide. Also fluctuations in water pressure, variations in the character of furnish, etc., influence the incidence of slime breaks very markedly. Bacterial colony counts, although helpful, cover too wide a field of microorganisms, both slime forming and nonslime forming, to afford accurate correlation of the slime forming potential in the mill and the counts obtained.

The use of slime boards properly placed in the mill system, on which slime forms and from which it can be scraped, weighed and recorded as the number of grams deposited per square foot per 24 hours, has been found to be the best guide to date. Daily variations in the weight of slime formed allow adjustment of toxicant addition to suit prevailing conditions. Again, it should be emphasized here that this cannot be taken as an absolute guide, experience showing that, at times, the slime deposited is not necessarily related to the trouble experienced by slime in the mill.

**Choice of Toxicants**

The theory of immunity has been advanced as a reason why a toxicant will not work over a long period. Work done at The Institute of Paper Chemistry, Appleton, Wisconsin, proves that this is quite possible. It is felt, however, that this theory is not necessarily applicable when treating slime on a mill scale.

It is the author's contention, quite divorced from the theory of immunity, that no one specific toxicant provides a ready made cure-all for slime. In some mills chlorophenates alone often control slime for quite lengthy periods. In other mills mercurials are often satisfactory. Both these statements are also true in the case of Anglo, but during the greater part of the year it has been found that a proportion of both is necessary to maintain economical slime control.

Toxicants are added to the system once daily over a two-hour period. This gives a high concentration for a short period and has a greater inhibiting effect than treating continually or adding toxicants over a longer period. Due to the large volumes of water used, when toxicant additions are extended to cover the full day, the dilution is too great to obtain the necessary concentration for inhibition at an economical cost level. Also, there is a certain amount of retention of toxicant in the system and it has been found by experience that a heavier treatment during the first few days, tapering off during the remainder of the week if slime formation has been inhibited, is the most effective treatment. On Saturday, if there has been no serious build-up of slime in the system, the treatment is omitted. After shutdown on Saturday night a thorough wash-up program is rigidly adhered to. Water carrying a residual of 1 to 1.5 ppm is then circulated through the different white-water and stock systems.

**Toxicant A**

The pattern of infection at Anglo is composed of many different types of slime-forming organisms. This pattern changes rapidly and often, making choice of a proper toxicant a difficult one. Generally speaking, however, experience at this mill has been that both mercurials and chlorophenates are necessary most of the time.

Toxicant A, a solution of chlorophenates and organomercurial compounds, is the toxicant most consistently used at this mill, and enables the maintaining effective slime control economically during the greater part of the year. During certain periods, however, when infection is very high, experience has shown that additional mercurials are necessary to maintain control. This extra mercurial can be provided in two ways, i.e., by increasing the use of toxicant A, or by addition of a straight mercurial. The latter practice has proved to date to be the more economical due to the fact that in the former an excess of chlorophenate is also provided, making the mercurial constituent quite costly.

Toxicant A shows best results when used close to the points of infection and for this reason is used in the paper mill, the largest percentage of it being applied to the flat box water. This water is used on wire showers and for wire pit make-up water. In January, 1947, on the assumption that a greater concentration of toxicant in the headboxes would improve

control, the point of application was changed to the fan pumps. Slime control deteriorated rapidly, probably because of too great a proportion of toxicant going out in the sheet instead of remaining in the system for a longer period. On returning the point of application to the flat box water, control picked up quickly.

**Toxicant B**

In February, 1947, when the cost of control obtained using toxicant A was high at 51 cents per ton, it was decided to replace some of toxicant A with toxicant B, a phenyl mercuric lactate. Toxicant A was at this time being used in the groundwood filtrate and in flat box water. Toxicant B was now added to the groundwood bull screen chest and addition of toxicant A to groundwood filtrate system was discontinued. Very much improved slime control resulted and the cost of treatment dropped to a low of 14 cents per ton. By this time all toxicant A had been replaced by toxicant B, the addition of toxicant B, in powder form, to the paper mill system being made through the broke beaters. This tended also to increase concentration of toxicant in groundwood stock and provided at the same time, due to our hook-up, treatment for the broke chest and groundwood storage tank. A slight build-up of slime was noted in the paper mill during this time, but it was of a rather tacky nature and did not break away and cause trouble.

In late March and early April with the spring breakup, the pattern of infection changed rapidly and only on a restoration of toxicant A with its chlorophenate constituent was control maintained. Unfortunately at this time slime boards were not being used and hence a rather rapid buildup of slime in the system was not noted, a build-up which could have been prevented had it been detected soon enough and treated for accordingly. The heavy slime that did build up, did so at a time when debris and ice were continually clogging the water inlet so that variations in water pressure were experienced, causing surging in the tanks, headboxes, etc. This in turn caused slime to break away, resulting in more breaks than would have occurred under normal conditions. During this period cost of treatment was increased until the turning point was reached when slime deposits in the mill started showing a decrease. Immediately when a decrease was noted it was possible to reduce the amount of toxicants used and at the same time enjoy more positive control.

**Toxicant C**

Toxicant C, a phenyl mercuric acetate, is used in place of toxicant B when additional mercurials are needed in the paper mill. From experience gained in this mill, this toxicant, being more soluble, does not need to be applied as far back in the system as toxicant B. Slime build-up is lower in the paper mill with the same cost per ton as with toxicant B.

Apart from chlorinating all mill water and using chlorinated water in all wood handling operations, toxicant additions are now seldom made in the groundwood mill. When, however, treatment is found necessary here, toxicant C or B, introduced in the grinder flumes or after bull screens, has been effective.

**Toxicant D**

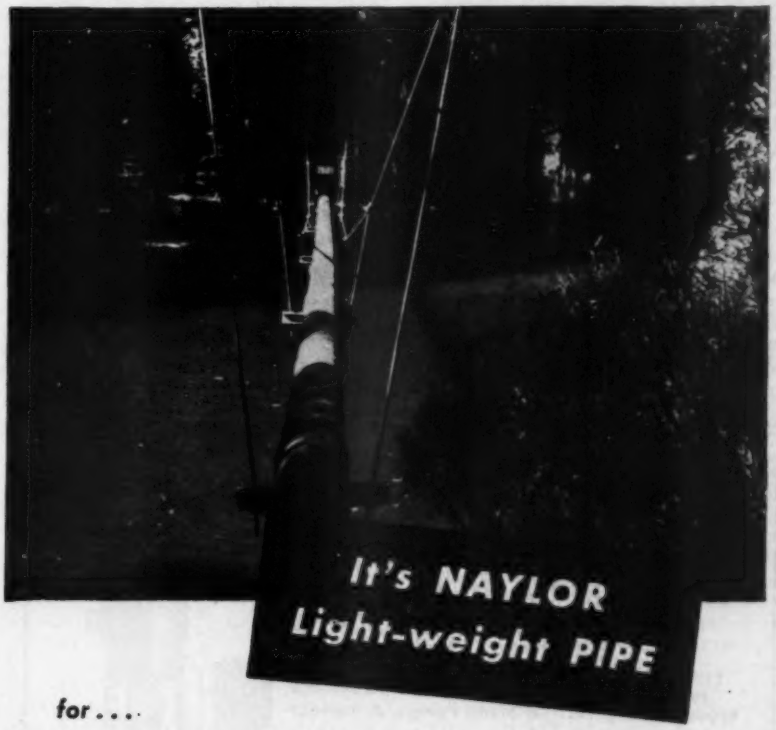
Toxicant D is an ethyl mercuric phosphate compound. Although this toxicant has been used successfully in some mills, it has not been found satisfactory at Anglo to date, due largely to the difficulty encountered in getting it into solution and trouble experienced in handling it. A more soluble form of this toxicant is expected to be available shortly, which will warrant further trials on a mill scale.

**Other Toxicants**

Several other toxicants were used on limited and on mill scales, but due to the very poor results obtained their use was discontinued, in most cases after very fair trails.

Cost of treatment for 1947 will average approximately 40 cents per ton. After duty drawbacks on imported chemicals used in manufacturing processes are taken into account, this cost will actually be reduced to approximately 36 cents when all claims have been settled. It is felt that this cost can be further reduced during 1948.

To date the approach of the great majority of paper manufacturers to this seemingly complicated business of slime control has been largely chemical. It is the writer's opinion that the problem of slime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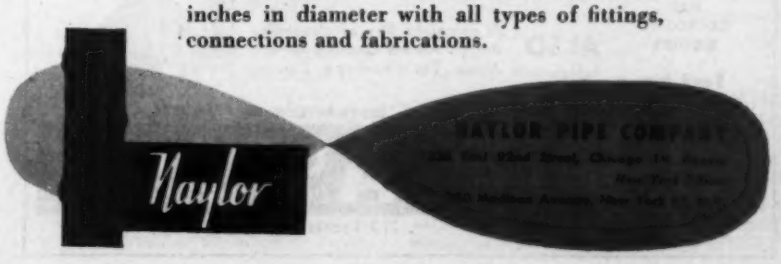

control is also a mechanical one. It is common knowledge that less slime forms on smooth metal or tiled surfaces than on smooth wooden or porous surfaces; that streamlined pipes present infinitely less chance for stock to accumulate and decay than pipes welded at sharp angles or blanked off, creating pockets; that closed-in filters are less subject to pollution from air-borne slime; that where stock or white-water is continually in motion that less slime forms than where flow is arrested; etc. The present slime control bill of the industry is undoubtedly large. What proportion of the money presently allocated for chemical treatment might be better spent on streamling stock and white water systems and closing-in filters, headboxes, etc? In the answer to this question might well lie the key to very greatly improved slime control at substantially lowered cost of chemical treatment.

## Suction Rolls and Vacuum Requirements—A Rational Approach

**E. T. BUCHANAN, Asst. Ch. Eng.**
**Consolidated Paper Corp., Ltd.**

Since the introduction of suction rolls nearly forty years ago to improve paper machine operation their use has become almost universal and in the case of high speed paper machines, indispensable. Along with each suction roll a vacuum pump is needed to provide the suction desired.

The intent of this paper is to study the fundamental relations between suction roll and vacuum pump with due allowance for operating variables and to develop workable rational formulae for use in determining vacuum pump capacity, for predicting results of operating changes and eventually as a guide in design and the attainment of optimum operating conditions. This is much more difficult than would at first appear from the apparently simple operations at couch and presses. The operating variables involved are numerous and complex and their complete evaluation not yet possible.

For purposes of considering a formula for suction roll air requirement one may state briefly that the amount of air to be handled by the vacuum pump is the sum of "air from holes" and "air leakage." Expressions for each of these terms must be devised so as to allow as nearly as possible for pressure (vacuum) and temperature variations as well as mechanical and operating variables.

Vacuum air requirement (or volume of air to be handled by the vacuum pump) for a given suction roll and a given set of operating conditions is expressed algebraically in formulae (1) and (2). These expressions have been developed assuming adiabatic frictionless flow through leakage paths and while this is not strictly true are believed to approximate as simply as possible the required relationship. This leads to the idea of constant air leakage beyond the theoretical critical 14 in. Hg. vacuum.

There are, moreover, many mechanical, operating and other variables which affect results; therefore, the formulae should be used with considerable caution pending further study and correlation of data by interested people in the pulp and paper industry.

For the vacuum range up to 14 in. Hg. the air volume is:

$$Q_{vac} = Q_h\,(R\text{-}1) + f\,A_h\,V_2$$

$$= Q_h\left(\frac{P_{vac}}{29.9 - P_{vac}}\right) + f\,A_h\left\{1.53 \times 10^5 \sqrt{1 - \left(\frac{29.9 - P_{vac}}{29.9}\right)^{0.286}}\right\}$$

$$\left(\frac{29.9}{29.9 - P_{vac}}\right)^{0.286} \qquad \text{.....(1)}$$

For the vacuum range 14 in. Hg. and above the air volume is:

$$Q_{vac} = Q_h\,(R\text{-}1) + f\,A_h\,V_c$$

$$= Q_h\,\frac{P_{vac}}{29.9 - P_{vac}} + f\,A_h\,75{,}000\,\frac{15.9}{29.9 - P_{vac}} \qquad \text{.....(2)}$$

where

$Q_{vac}$ = air volume at vacuum $P_{vac}$ cfm.
$Q_h$ = volume of holes entering vacuum area per minute, cfm.
= $A_h$ t l S where:
$A_h$ = perforated area at surface of roll, sq. ft./sq. ft.
t = roll shell thickness, ft.
l = deckle width, ft.
S = machine speed fpm.
R = compression ratio, atmosphere to vacuum
f = sheet quality factor
$A_b$ = perforated area of roll over box opening
= lw$A_h$
w = width of box opening, ft. (for couch use area of countersunk opening for $A_h$)
$P_{vac}$ = differential pressure acting on sheet and assumed same as at roll suction box
= vacuum, in Hg.
$V_2$ and $V_c$ = air velocity through orifice
Consider formulae 1 and 2 in detail.

*Air Volumes for Suction Roll* — $Q_{vac}$

$Q_{vac}$ — Care must be exercised in applying this volume directly to the pump as obviously it refers to vacuum conditions at the roll suction box and may have to be adjusted for pipe friction and temperature. For pipe friction the value of $Q_{vac}$ must be increased in the ratio of absolute pressures at the suction box and at the pump to get pump cfm (i.e. ratio $\frac{29.9 - P_{vacs}}{29.9 - P_{vacp}}$). Usually no temperature allowance is needed as in practice there is very little temperature change along the pipe.

*Air from Holes* — $Q_h$ (R-1)

$Q_h$ — As far as a suction roll is concerned this quantity is a constant determined by the dimensions of the roll and the machine speed. However, where a couch roll is

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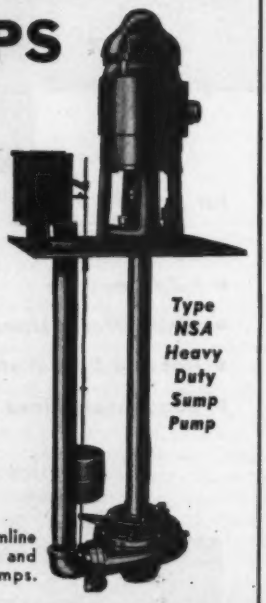

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concerned, the countersinking (if any) of the holes and the voids in the wire introduce an additional volume of approximately 5% which should be added to the calculated value of $Q_a$.

(R-1) — In holes $Q_a$ the volume of entering air at vacuum is obviously $Q_aR$ while the air leaving at vacuum is $Q_a$; thus by difference we have $Q_a$ (R-1) for air from holes. This assumes that any hole as it leaves the vacuum area is evacuated to the vacuum of the suction box and the air in it is at the same temperature. The former is undoubtedly true but the average temperature in the holes is probably slightly lower than in the suction box due to moisture evaporation especially at the presses. Numerically the volume correction for this temperature difference would be small and therefore no allowance is made.

*Air Leakage* — $fA_bV$

Though air leakage may come either through the sheet, between suction box sealing strips and roll, or through holes incompletely sealed by the sheet no attempt is made to show separate terms in the formula. All leakage is assumed to follow the laws of adiabatic frictionless flow through orifices (9) and though this is not strictly true the leakage term of the formulae are developed accordingly.

While generally speaking the leakage will increase as the differential pressure across the sheet (or orifice), it is important to remember that this *leakage will not increase after critical downstream pressure* is reached. For the case considered here this "downstream" pressure is the pressure in the suction box and is assumed to occur at the theoretical critical pressure ratio of 0.53 for air which gives:

Critical pressure = 29.9 x 0.53 = 15.9 in. Hg. abs. or = 14 in. Hg. vacuum.

Experiment is needed to determine the critical pressure actually obtained through the capillary openings of the sheet.

*V*—The values used in formulae (1) and (2) for air velocity ($V_2$ and $V_o$) follow laws of fluid mechanics for air. As inserted in the formulae to obtain volumes at suction box conditions they also include correction for further expansion and for temperature, which is assumed to rise very quickly to the value it had before adiabatic flow through the orifices. Heat for this temperature increase comes partly from the suction roll shower water and partly from water in the sheet. In suction presses many mills use warm water roll showers to supply sufficient heat and prevent ice accumulation in the suction box.

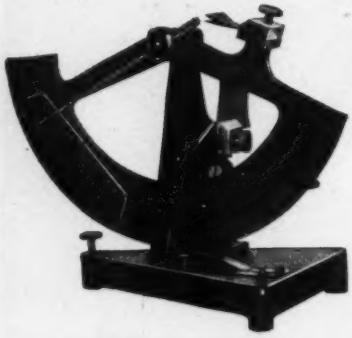
*f*—This sheet quality factor will have to be determined experimentally and ultimately it is hoped that the relative effect of variables inherent in it (basis weight, type of pulp, freeness, temperature, specific surface, compressibility, etc.) may be numerically determined and f broken down into separate factors. For the present one must be content to determine f numerically by a series of tests and attempt to relate it to the pulp and machine conditions involved. The f values will be affected by the use of dandy or presser roll at the couch due to compacting of the sheet. Values, for couch and press will probably differ, being smaller at the press but it is not known what, if any, relation exists.

Any leakage at sealing strips, uncovered holes, etc., will also affect the value of f and mechanical conditions need careful checking. Inherent in the factor is the combined value for discharge coefficient of all "orifices" through which the leakage occurs. Obviously there is no possibility of separating these at present. It is interesting to point out that if the discharge coefficient is unity then f indicates directly the extent of sheet porosity.

*Ab*—In restricting this symbol to mean the perforated area of roll over box opening it is implied that the effect of vacuum does not spread through wire or felt to the area between holes. It is unknown to what extent such spreading does or does not occur but restriction of the symbol meaning in this way recognizes the general experience that where couch holes are countersunk with resulting larger open area under the wire a greater pump capacity is required for a given vacuum. Quantitative information is lacking and tests are required to determine the correctness of calculating $A_b$ in this way.

**Operating Variables**

The foregoing detailed discussion of the proposed formulae for suction roll air requirements will have made it abundantly clear that considerable experimenting must be done to prove many of the assumptions and especially to evaluate the sheet quality factor f. Paper machine operators are well aware qualitatively of the effects of many



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variables which it is hoped to represent numerically by f.

As a first step the proposed formulae were applied to couches and presses of several newsprint machines at operating conditions. For a few of these, accurate data including mechanical details, air volumes and vacuum, etc., were available while for others some of the data was approximate or had to be estimated. Substitution of the data in either formula (1) or (2) allowed "f" the only remaining factor to be calculated. As anticipated this "f" varied widely, being generally less for a press than a couch, but there is as yet insufficient accurate data for discussion of changes in the value of "f."

In considering immediate practical application of formulae (1) and (2) it would seem they can be safely used to predict minor changes in operating conditions. Performance of different machines may also be compared by evaluating "f," but accurate mechanical and operating data are required and until considerable information is accumulated the comparisons can only be considered an approximate guide.

For design and for considering changes to improve operation there are many uncertainties and much experimental work is indicated to analyze and interpret the effect of all possible variables.

**Vacuum Pumps**

Several types of vacuum pump are available from machinery manufacturers to handle the rather large volumes of air involved. All are being used successfully and it is the responsibility of the paper mill man to choose the type best suited to his particular requirements. Pump types are (a) rotary water-ring such as the Nash, (b) rotary positive lobe type such as made by Roots-Connersville, (c) reciprocating type such as made by Canadian Ingersoll-Rand, and (d) centrifugal type made by Sulzer and by Roots-Connersville. No doubt other types have been or are being developed and certainly there are other manufacturers making similar suitable equipment. Single or multistage arrangements are used according to requirements and the latter may be essential for very high vacuums. In paper mill vacuum applications the rotary water-ring type, rotary positive lobe type and the reciprocating type are usually single stage, the centrifugal type almost without exception is multistage. The rotary positive type is sometimes double stage where power economy is important.

Considerations affecting the type of pump chosen for a particular application will include its power economy, its reliability and freedom from maintenance, its first cost and physical size and its ability to handle water with the air. Flexibility is also important as actual vacuum requirements may vary considerably from design values both as regards air volume and pressure.

It is realized that much yet remains unanswered regarding the relation of suction rolls and air requirements. Many assumptions, perhaps some which are incorrect, have had to be made. Nevertheless, it is hoped this rational approach to the subject may stimulate interest and lead to further investigation and research in the interest of the pulp and paper industry.


**Acknowledgments**

In closing I wish to acknowledge with thanks the enthusiastic co-operation and friendly advice from many people during the preparation of this paper. Many tests and measurements were kindly made to provide data for the practical examples given. In particular I must mention Messrs. D. L. Dowling and M. Nusim (District Manager, New York, and Consulting Engineer, respectively, of Roots-Connersville Blower Corporation) for their keen interest and helpful advice which saved me from many pitfalls in developing the relations presented.


**Appendix A**

Some Commonly Used Rules for Vacuum Pump Capacity:

1. As used by Dominion Engineering Works for double box suction couches (data January 4, 1945).

"Capacity of vacuum pump or pumps in cubic feet per minute at the operating vacuum for the first compartment should be 210 to 230 times the suction box area in square feet plus 3.5 times the width of the wire in inches, and for the second compartment, 550 to 600 times the suction box area in square feet plus 7 times the width of the wire in inches. This is for a speed of 1,200 fpm and for higher or lower speeds the pump capacity should vary approximately in direct proportion to the square root of the speed."

2. As used by Nash Engineering according to P. R. Sandwell (The Mechanical Design of Newsprint Machines, The Wet End, *Pulp & Paper Manual of Canada*, 1947).

(a) Couches

"Couch vacuum pump capacity for newsprint machines running at speeds of from 600 to 1,500 fpm should be from 18 to 22 cfm per inch of width at a vacuum of 15 in. to 17 in. Hg. This is for a 6 in. box and the quantity will vary directly with the box width."

(b) Presses

"The quantity of air to be handled at speeds of from 600 to 1,500 fpm on a roll with a 4 in. box varies from 9 to 11 cfm per inch of width, at 14 in. to 16 in. Hg."


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## Widening Uses for Wood Waste

**T. A. McELHANNEY, Superintendent**
**Forest Products Laboratories**

Between the standing tree and the finished product losses of many kinds occur, ranging from material actually discarded to that which is manufactured and utilized inefficiently.

The total of these various losses amounts to a considerable percentage of the volume of the timber stand, occasionally even as high as 70 per cent. Better utilization offers an immediate means of prolonging the present supply of timber; it may also result in increased financial return by lowering the unit cost of the finished product.

The problem of wood waste may be met in two ways; first, by reducing waste at the source through improved manufacturing methods and closer utilization, and second, by increasing profitable uses for such waste as now occurs.

The conversion of the standing tree into sawlogs, poles, piling, railway sleepers, or pulpwood results in wood waste, which varies in volume and value according to the species cut and the method of logging. Some waste, such as tree branches and tops, is often unavoidable; much, however, is unnecessary. for example, high stumps, unnecessarily large tops, broken logs resulting from careless falling, merchantable material overlooked by the skidders, and the non-utilization of so-called inferior species.

Recent experiments indicate that an inexpensive method of treating standing trees with a killing chemical that will facilitate bark removal may be developed. It is claimed that such a process will promote drying of the wood while standing. If successful and economical, this treatment should tend to reduce sinkage losses as well as to render slabs and edgings more usable for pulp chips by reducing the amounts of wood lost in barking such material by mechanical means. Chemicals proving most effective to date have been certain water-soluble arsenic compounds. Water-driven logs treated thus tend to lose their bark during transit.

An interesting trend in the lumber industry of western Canada, especially in the Douglas fir region, is the increased utilization of the smaller sizes and poorer grades of sawlogs. This is a result of the depletion of the more readily accessible stands of large timber, also of improved machinery and methods for logging smaller logs and scattered small tracts of timber.

Waste studies by the Forest Products Laboratories of Canada show that in manufacturing sawlogs into lumber, the following is the percentage breakdown:

| | Douglas Fir | Spruce |
|---|---|---|
| Green lumber ..... | 72.7 | 49.0 |
| Slabs, trim ..... | 12.9 | 34.4 |
| Sawdust ..... | 14.4 | 16.6 |

The wide differences in the manufacturing procedure, in the size of the logs and in the size of the average mill between the Douglas fir region of western Canada and the spruce region of eastern Canada preclude any direct comparison between the results of these waste studies.

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Application of these percentages to the lumber cut in Canada indicates that each year over 200,000,000 cubic feet of sawmill waste, exclusive of sawdust, are produced.

Sawmill waste is bulky and expensive to ship by rail or truck. Present methods of waste utilization bring in only a comparatively low return on a unit basis and provide little outlet for the isolated mill. Large mills accessible to existing markets, however, derive an appreciable annual revenue from the sale of mill waste.

In addition to the waste that occurs in the sawmill, there is a further reduction in wood volume in the planing or dressing mill.

Staudies made by the Laboratories show that about 30 per cent of the volume of lumber sent to the planing mill is removed in the form of shavings. Where more profitable uses have not been found, the shavings are normally used as fuel in the mill power plant. In some cases, however, their disposal is such a problem that they are either placed in large piles to rot or are used as filling materials around the mill yard.

Shavings either as they come from the planer or after having been processed in a hammer-mill, in some parts of Canada, are used extensively for wall and ceiling insulation.

Wood flour made from dry pine, spruce, and balsam planer mill shavings is used as a filler in such widely varied products as linoleum, dynamite, resinoid plastics, and wallpaper, generally in finenesses of from 30 to 200 mesh. A rising demand has resulted from the rapid expansion in the use of plastics where wood flour is used as an extender with synthetic resins.

The principal wastes in veneer production occur in the initial rounding, which produces "fish-tails" of varying sizes, and from the core which remains after the log has been peeled down to the lathe chucks. Clipper waste in trimming the veneer sheets is also considerable.

Clear cores of softwoods of certain species can be chipped or ground for the production of pulp. Hardwood cores are utilized for the production of crating stock, flooring, and, if free from major defects, small dimension stock. Defective cores are occasionally used to produce newsprint core plugs or are hogged and burned for fuel to produce steam for the plant, or sold as cordwood.

Scrap veneer and plywood trim lend themselves to the production of compressed impregnated materials. There is a field for compreg material for dies, pressure blocks, pulleys and wearing wood parts.

When pulpwood is cut in pure stands of softwood, there is very little preventable waste. In the case of mixed stands of hardwood and softwood, where wood has to be transported by floating down rivers, the heavier hardwoods cannot be floated at all, and the lighter for short distances only. As a consequence, a good deal of hardwood is left in logging such stands. Where mixed forests are served by roads, the merchantable hardwood is logged either by pulp companies or by subsidiary operators who take out the material for sawlogs, veneer logs, or other purposes.

In order to conserve forest stands of pulpwood species, increasing attention is being given to the utilization of slabs and edgings from sawmill operations, where their cost does not exceed the cost of roundwood. In some sawmills, long-log barkers have been installed to remove the bark from the logs before they are sawn. The resulting slabs can be chipped for chemical pulp without the heavy loss that occurs when slabs have to be barked on hand rossers.

On the Pacific Coast, in cutting sawlogs, a great deal of material, often up to 20 cords per acre, is left on the ground in the form of small and broken logs. Considerable attention is being paid to the relogging of these areas with lighter equipment than that used for the primary logging, making use of available roads and other facilities.

Extensive stands of timber are frequently partially or totally killed by fire, storms, or insects. The problem then presents itself of salvaging as much as possible of this dead timber. Death of the tree immediately exposes the sapwood to fungal attack, and with the passage of time the penetration of fungi is progressively deeper.

Up to the present the main processes for chemical utilization of wood have been: (1) manufacture of chemical pulp, (2) destructive distillation, and (3) wood hydrolysis. None of these processes can claim to have solved completely the problem of the chemical utilization of wood waste.

The waste liquor obtained in sulphite pulping contains about 2 per cent of sugars of which about 75 per cent can be fermented to produce ethyl alcohol. Of recent years this has become an important source of alcohol, especially in Sweden and Germany where it is reported that practically all of the fermentable sugar in sulphite waste liquor is utilized.

The Ontario Paper Co. Ltd., Thorold, Ont., is operating a 2000-gallon per day plant producing alcohol from sulphate waste liquor. The Puget Sound Pulp and Timber Co. at Bellingham, Washington, is also operating a plant having a yearly capacity of 2,500,000 U. S. gallons.

A company in France claims to have developed a process for the utilization of finely divided wood waste, such as shavings and sawdust, by heating it with a mixture of caustic soda and lime. About twenty per cent of oils, based on the weight of the wood, are obtained, of which 50 per cent are ketones, 25 per cent hydrocarbons, and 10 per cent alcohols and phenols. It is claimed that the ketones and hydrocarbons can be used as solvents and plasticizers.

A good possibility for utilization of lignin might be found in the electrochemical treatment of lignin solutions from waste sulphite liquor. This is a practically undeveloped field and requires considerable further fundamental research. By electrolysis the lignin present in solution can be broken down to yield


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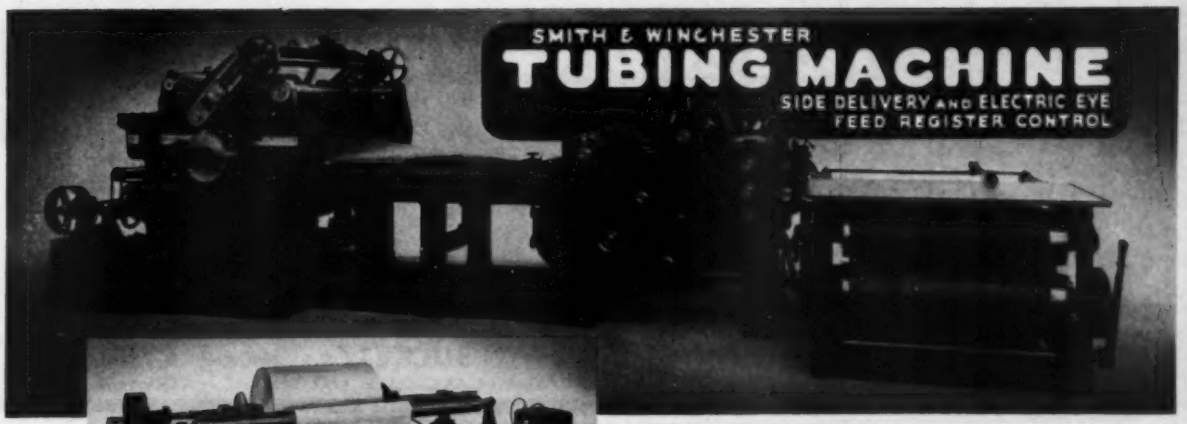


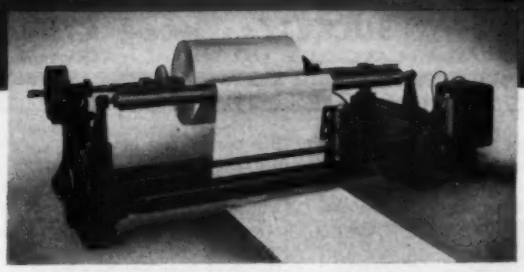

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valuable products, such as organic acids, ketones, etc. In addition, it is conceivable that a considerable part of the base used in the cooking liquor can be recovered from the cathode deposits.

An interesting and relatively unexplored field of utilization for wood waste, particularly sawdust, is the microbiological approach. Experimentally, wood flour has been used as a culture medium for the growth of certain bacteria, resulting in the production from the wood of valuable organic acids, such as acetic, lactic, gluconic, and citric. One can visualize the possibility of the transformation of large piles of sawdust by microbiological action into valuable organic chemicals without the use of chemical reagents, and without expensive plant equipment.

Methods for the nitration and acetylation of wood have been reported. It is claimed that nitration lignocellulose material can be used in the preparation of films, filaments and lacquers. Actelylated wood has been reported to have greater dimensional stability than ordinary wood.

The preparation of cellulose from sawdust by existing pulping methods is not attractive. However, new approaches are conceivable, either in the design of adequate equipment or in different methods of delignification. For example, methods used for the hollocellulose determination on finely divided wood might be given some consideration as potential sawdust pulping methods. Some such approach might open avenues for the utilization of sawdust in the cellulose plastic field.

Chemical studies on barks are only in a relatively early stage. However, there are indications that certain barks which contain a very high proportion of low-methoxyl, acidic constituents might, in finely divided form, react with an aldehydic constitutent to produce valuable plastic products. It has been reported recently that phlobaphenes, extracted from pine bark, are excellent plasticizers. It is apparent again that research is a prerequisite to the widening use of wood waste in the plastics field.

Chipper sawdust can produce reasonably good stock when processed in a machine such as the Bauer refiner or a Sprout-Waldron attrition mill. Good quality chips obtained from waste from sawmill operations should, of course, be diverted to pulp mills wherever possible, but low-grade chips or chips from mixtures of wood and bark might be used to advantage in structural board manufacture.

One method of extending or encouraging the wider use of wood waste for structural board manufacture would be the designing of equipment which would permit of the processing economically of relatively small amounts of wood waste. By present methods for board manufacture from fibrous raw material, it is estimated by some authorities that a plant costing two to three million dollars is required. This immediately excludes small operators from the structural board field.

The structural board field would appear to be one where waste wood can replace round wood as the raw material and, if for this reason only, is worthy of thorough investigation.

Bark in a number of species, makes up about 10 to 15 per cent of the total tree volume and considerable interest is being shown in the possibility of utilizing it for purposes other than fuel. Tannins have been extracted from certain barks for a long time, but these materials only form a part of the total extractive present. The quantity of extractives in black spruce, white spruce, and balsam bark, for example, varies from about 36 to 48 per cent. It is quite conceivable that these extractives may contain several valuable constituents in considerable quantity. Work is at present in progress at the Pulp and Paper Research Institute of Canada on the separation and identification of the extractives in spruce bark.

One company on the U. S. Pacific Coast has recently erected a plant for the recovery of products from Douglas fir bark. The products are claimed to be of use as fillers, as ingredients in phenolic glues, in thermosetting moulding compounds, in insecticides and as soil conditioners. This development is the result of research carried out by a private company, and suggests the necessity for research in this field if success is to be achieved.

Extractable materials are present in wood, bark, and leaves. Although production of extractives can utilize only a small portion of the waste material, yet such production can be a source of revenue. In some cases, extraction might

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influence the utilization of the residue by rendering it more susceptible to other forms of utilization. Extractable materials that might be produced in Canada are: tannins and other materials from bark; essential oils from leaves; resinous products from wood.

## By-Products from the Kraft Pulping of Pine Woods


**OTTO KRESS, Technical Director**
**Institute of Paper Chemistry**


Two valuable by-products from the various species of pines are obtained incident to the kraft pulping operation. During the recovery operation, so-called skimmings (from which tall oil is prepared) are obtained from the black liquor. Turpentine (commonly known in the trade as sulphate turpentine) is recovered by condensation from the relief gases during the actual digestion of the wood.

### Tall Oil

A bibliography on tall oil, prepared by Clarence J. West in 1942 and again in 1945, covers 571 abstracted literature and patent references.

In view of the shortage of oils and fats in the recent war period, the United States War Production Board asked the writer to make a survey of the potential tall oil production of the kraft industry by visiting the Southern mills. The objective, of course, was to recover the skimmings and to persuade mills which were not recovering them to do so. The survey indicated a potential production of 110,000 tons based on a 340-day operating year. Since that time, the construction of additional kraft mills and the enlargement of existing mills in the South, have increased the potential production. At that time the potential tall oil production from northern United States mills was not considered but at present most of these mills are recovering skimmings from the pulping of jack pine.

The skimmings are recovered from the black liquor by pumping into a suitable tank where the skimmings are floated from the upper liquor level into a suitable storage tank. The equipment varies from simple overflow tanks to specially built equipment which secures an increased yield of the skimmings. The amount of skimmings recovered varies from 150 to 300 pounds per ton of pulp, depending upon the efficiency of recovery, species of wood, locality of growth, season of cutting, length of time of storage in the wood yard, and, also, the growing conditions of the wood and other factors. The yield of tall oil is in general from 50 to 55 per cent based on the weight of the skimmings.

The fuel value of skimmings varies from approximately five to six dollars per ton, depending upon the cost of coal and the soda content. This is based upon typical skimmings which run approximately 30 to 35 per cent water, 5 to 10 per cent black liquor solids; the balance being soap. The fuel value is in the order of 8000 to 9000 Btu per lb. and the sodium content is approximately 6 per cent sodium oxide. It is evident, therefore, that, unless a mill which disposes of its skimmings obtains a reasonable price for them, the savings made by shipping rather than burning the skimmings will be minor.

The following is a typical method of preparing crude tall oil, although some phases of the operation vary in each plant depending upon the conditions employed. From a suitable storage tank, strong 66 deg. Bé. sulphuric acid is pumped, usually by air pressure, into sufficient water to produce hot dilute acid of about twelve normality. The soap is then pumped into the tank by air pressure or by some positive type of pump, such as a rotary or piston pump. During the introduction of the soap, the mixture is continuously boiled by the admission of direct steam through a lead pipe provided with suitable openings. Soap is pumped into the tank until the normality of the mixture is reduced to 0.3 or 0.4 (as determined by titration), and the boiling is continued for one hour. The mixture is allowed to settle; the total time of actual boiling and settling being six hours. In general, a period of twelve hours is required for the complete cycle, including cleaning of the tank. This cleaning involves the removal of the lignin which is disposed of by burning in a dark burner. During the settling period, the oil rises to the top and the acid layer is either drawn away to the sewer or, if salt cake has been used as a washing medium the dilute acid water layer is drawn off into the waste salt cake storage tank, where there is sufficient alkali from the washing of the soap to neutralize in part the acidity of the liquor; the balance being neutralized with alkali. This mixture of salt cake and black liquor is then handled in the usual manner through the recovery operation, thereby saving these chemicals. Many mills prefer to float off the oil by water, thereby washing the oil, rather than to drain it from the acid tank; whichever method is employed the end product represents a crude tall oil and comprises the bulk of the material on the market.

At present, kraft mills are converting the skimming to tall oil and, in many cases, are purchasing skimmings from other kraft mills which do not have tall oil plants. Other mills sell their skim-


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mings to converters who make the tall oil. Such mills separate the skimmings by flotation from the black liquor (25 to 30 per cent solids, taken between second and third evaporator effect) and pump them to a railroad tank car. The solution stands in the car for at least eight hours and preferably overnight. The free black liquor is then withdrawn from the bottom of the solution and is replaced with skimmings.

Tall oil naturally varies in composition, but the following is an average composition of a southern tall oil:

| | Per Cent |
|---|---|
| Unsaponifiables | 5 |
| Combined ash and moisture | 1 |
| Fatty acids | 50 |
| Rosin acids | 44 |

The following is a complete analysis of a refined tall oil produced by treating the crude tall oil with a petroleum product, acid-treating the mixture, separating the sludge, treating the liquor with an activated clay, filter pressing, and distilling the volatile solvent:

| | |
|---|---|
| Specific gravity (at 15.5 C) | 0.9697 |
| Acid number | 164.0 |
| Saponification number | 173.6 |
| Ester number | 9.4 |
| Moisture, % | 0.0 |
| Rosin acids, % | 39.2 |
| Fatty acids (by difference), % | 52.79 |
| Linolenic acid, % | 19.25 |
| Linoleic acid, % | 10.5 |
| Oleic acid, % | 23.04 |
| Unsaponifiables, % | 8.01 |
| Iodine number | 148.83 |
| Thiocyanogen—iodine number | 91.1 |
| Saturated fatty acids, % | None |
| Titer test, deg. C | 5.5 |
| Pour test, deg. C | 4.4 |
| Cloud test, deg. C | 10-12.8 |

The outstanding need at the present moment is a cheap process for separating the rosin acid portion from the fatty acid portion. The latter is the valuable portion of tall oil and the one which is a starting point for the manufacture of various organic compounds that have been found to be of considerable use in different industries.

The unsaponifiable portion of the tall oil is a very interesting component. This contains various sterols generally classified as phytosterol. The content of potential phytosterol in tall oil is lower than in certain other materials such as some fish liver oils and vegetable oils such as wheat germ oil. However, tall oil may be a relatively cheap source of phytosterol. Preliminary work of various investigators indicates a decided interest in the relationship of the constituents of the unsaponifiable portion to the possible production of vitamin D and certain hormones. The need for considerable and painstaking fundamental chemical research, as well as for final animal experimentation to determine the value of the products that might be produced, is self-evident.

It is to be borne in mind that the tall oil industry, as far as the United States is concerned, became of decided interest due to the natural shortage of oils and fats that occurred during the war period. When conditions become normal and animal and vegetable fats are again free, possibly our interest in tall oil as a raw material will decrease. Without question, in the European countries (especially Scandinavia) tall oil will be considered at all times a very important by-product from the kraft pulping industry.

**Sulphate Turpentine**

In 1946 sulphate turpentine production in the United States was 110,000 barrels which is equivalent to about 23 per cent of the total turpentine production of the United States.

The yield of turpentine varies, of course, and is dependent upon the species of wood pulped, the ratio of heart to sapwood, the season of cutting, the age of the wood, and the time of storage. The method and time of starting the relief on the digester for the recovery of the turpentine are also quite important. In the writer's opinion the relief should be started as soon as pressure appears on the digester, for the lower the temperature at which the turpentine is collected, the better will be the quality and yield. The yield from various woods varies tremendously, depending upon the condition of the wood. In general, the yield from slash and long leaf pine varies from about 2.8 to 4.3 gallons per ton of air-dry pulp. For loblolly, short leaf, and


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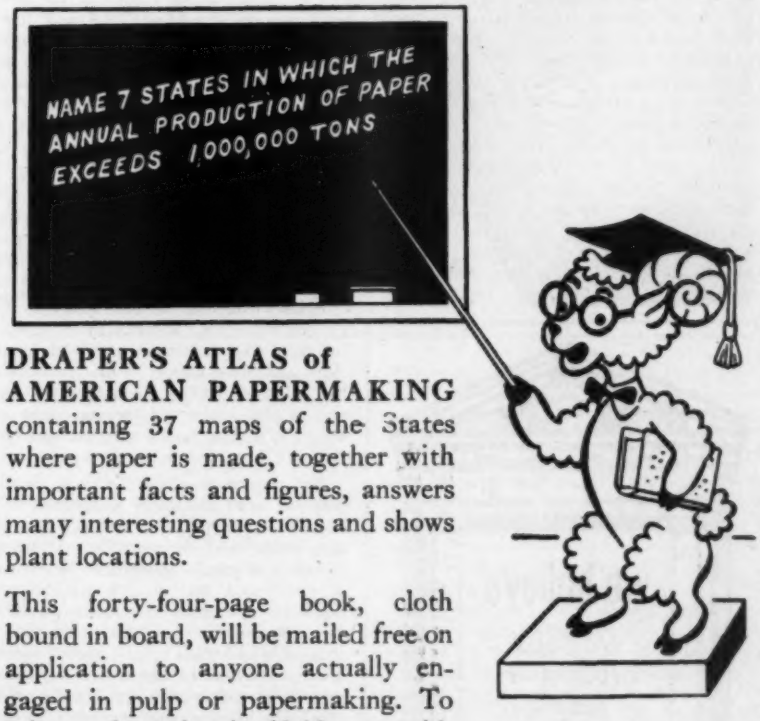


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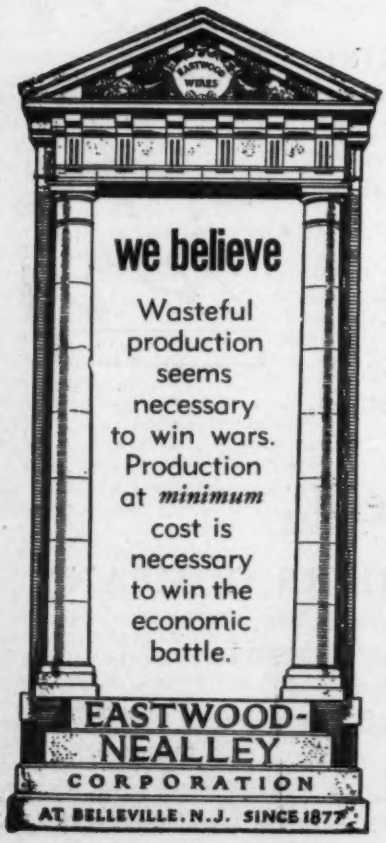
Virginia pine the yield varies from 1.5 to 2.7 gallons, whereas for jack and white pine, the yield varies from 1.5 to 3.1 gallons per ton.

The TAPPI Chemical Products Committee has published an article (Lawrence, W. P. Collection of Sulphate Turpentine, *Paper Trade J.* 124, No. 9:128, February 27, 1947), based on the results of a survey made in 24 mills in the Southern, Southeastern, and Lake States areas of the United States. Under the headings, "Digester Conditions," "Digester Relief," "Separator," "Condensers," "Decanters," and "Storage," the equipment used, as well as yield and other pertinent data are briefly described. Although such equipment can be purchased from heavy equipment manufacturers, many mills build their own equipment; the condenser, which is the most important part of the equipment, is usually of the simple, long-tube horizontal or vertical type.

The crude sulphate turpentine is objectionable in odor because of relatively small amounts of sulphur alcohols (i.e., mercaptans) and thioethers evolved during the cooking procedure. Many processes have been proposed and tried for the rectification of this trouble and probably the most successful procedure is that of fractional distillation, which has the advantage of recovering both the turpentine and the pine oil. Other processes for purifying the sulphate turpentine are aeration, treatments depending upon the use of sulphuric acid, oxidizing agents, alkalies or absorbent solids, treatment with ultraviolet light, etc. The writer believes that by fractional steam distillation and, if necessary, a possible treatment with a little bleaching powder, sulphate turpentine of a quality comparable with virgin turpentine can be prepared.

The outstanding use for purified sulphate turpentine is in the paint industry.

The sulphate turpentine, similar to virgin or steam-distilled turpentine obtained from pine stump and tap-root wood, consists mainly of alpha-pinene, beta-pinene and dipentane. These materials are of decided interest as raw materials in the terpene industry.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## Alkaline Pulping—Spruce


**J. S. HART and R. K. STRAPP**
**Research Associates**
**Pulp and Paper Research Institute of Canada**


The alkaline pulping program was undertaken by the Pulp and Paper Research Institute of Canada at the request of the Technical Section, Canadian Pulp and Paper Association. A great deal of preliminary work was done in order to establish the limitations of the equipment and to ascertain the best methods of procedure. This report is concerned only with the results obtained subsequent to the preliminary investigations.

The cooking was done by the authors but physical and chemical testing of the pulps was undertaken by those respective departments of the Institute and acknowledgment is made of their very valuable work.


Acknowledgment is also made to the Canada Paper Co., Windsor Mills, Quebec, for their co-operation in supplying spruce chips and black liquor, to the members of the Alkaline Pulping Committee for their very helpful advice and encouragement and to Dr. J. H. Ross for his very valuable services as a consultant on this project.


The request from the Technical Section was that work should be undertaken on a small scale; i.e., with a 1 cu. ft. digester, and that under carefully controlled conditions, the effect of certain variables be ascertained. It was hoped that if mill conditions of liquor-to-wood ratios were closely paralleled then the results would be comparable to those obtained when using standard stationary indirectly heated digesters. It was agreed that direct comparisons between the results obtained with small digesters and with commercial ones would not be possible.

Preliminary work showed that the equipment was capable of a ratio of liquor to wood slightly less than 3:1. It was therefore decided to standardize at a ratio of approximately 3½:1 liquor to B-D wood. In other words 4000 gm. B-D wood and 14 liters of liquor (including moisture in wood) was used for each cook.

Not all the variables requested have been investigated to date. Those reported upon here are the effect on yield and quality of the pulp of the following:

(1) Sulphidity
(2) Variations of active alkali charge at different temperatures
(3) Variations of time at different maximum temperatures
(4) The use of black liquor in cooking

This work has all been done using black spruce. The investigations are continuing using other species.

It was decided to conduct the sulphidity investigation in two parts. In the first set of cooks sulphidity would be varied but the active alkali would remain constant and hence as the sulphidity increased the effective alkali decreased. In the second set the effective alkali would remain constant and as the sulphidity increased the active alkali would increase.

The conditions of a standard cook, i.e., 1½ hr. to and 1½ hr. at maximum temperature of 170 C., were used in investigating variation in sulphidity.

From the results, it can be said that with the possible exception of pentosan content, viscosity and rejects, the addition of $Na_2S$ up to 20 per cent sulphidity does affect the cooking of spruce. From 20 to 40 per cent sulphidity, there is a small additional effect in most properties but, beyond that point, if the effective alkali remains constant, increases in sulphidity have no effect.

In other words, when $Na_2S$ is added, it hydrolyses to NaSH and NaOH and it is the NaSH, which in some way, aids cooking and this effect is particularly noticeable up to 20 per cent sulphidity. Beyond that, with the active alkali constant, it is the decrease in NaOH or effective alkali which influences the pulp. With the effective alkali constant, there is little or no further change.

Also, as sulphidities increase, regardless of whether the active or effective alkali is constant, $Na_2S$ is increasingly used up and it is doing no useful work beyond 20 to 30 per cent sulphidity.

It would appear that the maximum amount of $Na_2S$, expressed as $Na_2O$, consumed in doing useful work is between 1.5 and 2.0 per cent of the bone-dry wood.

The results obtained in studying the effect of variations of temperature and charge on the yield and quality of pulp produced from spruce do not give rise to any discussion. They simply show the results obtained for the given conditions of charge and temperature in use.

Similarly, the results obtained in studying the effect of variations of temperature and time at that temperature, on the yield and quality of pulp produced from spruce follow the same order as the temperature-charge material. Tables and graphs of mean values simply show the results obtained for the given conditions of temperature and time in use.

Black liquor is used in nearly all mills having stationary digesters, as make-up for the cooking liquor. Mills with rotary digesters use little or no black liquor as a rule. It is generally the rule, also, to use black liquor as a diluent taking no account of any alkali or sulphide it may contain.

There is an undoubted advantage in heat conservation and in using the digester as an evaporator when using black liquor in this way but the purpose of this investigation was to determine what, if any, were the effects on yield and quality of the pulp.

One series of cooks dealt with the use of black liquor as a diluent only. The charge of 21 per cent active alkali as $Na_2O$, was made up in concentrated white liquor and to this was added 15, 30, 45, 60 and 75 per cent black liquor respectively. Sufficient

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water was added in each case to bring the volume to 14 liters including the moisture in the chips. Duplicate cooks were run concurrently.

In a second series, the same volumes of black liquor were added but in this case the white liquor was adjusted to allow for the alkali and sulphide in the black liquor. The resultant cooking liquor had a constant active alkali charge and sulphidity.

The black liquor used in the two series above was from a mill system re-using black liquor and, therefore, would be expected to have reached an equilibrium for the conditions in use. It was decided for a third series to use a black liquor collected from single cooks in the laboratory digester, in which there was no black liquor to begin with. At the same time it was decided to collect this liquor from soda cooks and thus any influence in cooking would not be attributable to sulphide or sulphur compounds present. The black liquor was collected from cooks made in the small digester at the Institute.

In this third series three volumes of black liquor corresponding to 20, 40 and 55 per cent respectively of the total volume of liquor, were used. The white liquor was made up to contain all the $Na_2S$ for a 21 per cent charge and the NaOH was adjusted to agree with the alkali in the black liquor, the resulting cooking liquor then having a 21 per cent charge of active alkali as $Na_2O$, and a 33 per cent sulphidity.

In series 2 and 3 the solids content of samples of liquor on reaching temperature and at the blow were taken and the solids in the total volume calculated. From this figure the solids in the black liquor added plus the grams $Na_2O$ in the white liquor, were subtracted. The remaining figure was calculated as a per cent of the B. D. wood charged.

With the black liquor used as a diluent only the effective and active alkali in the cooking liquor, as found by titration, increased with increasing amounts of black liquor.

The total yield was constant from 0 to 45 per cent black liquor. At 60 per cent the yield increased sharply and at 75 per cent there was a falling off in total yield.

The screened yield was constant throughout the increases of black liquor but the rejects followed the same trend as the total yield.

Roe and permanganate numbers were constant to 45 per cent black liquor, then increased slightly at 60 per cent and finally dropped off at 75 per cent. These irregularities could have been the normal deviations and, therefore, these properties would be constant.

Viscosity was similar to Roe and permanganate numbers.

Pentosan was constant for increases of black liquor, as was burst, tear and time to develop 300 freeness.

In Series 2, the active and effective alkali charges were constant from 0 to 60 per cent black liquor. At 75 per cent black liquor it was necessary to add solid NaOH and $Na_2S$ to the black liquor and it was, therefore, more difficult to arrive at the correct charge. In this case the charge dropped slightly.

The total yield increased with increasing amounts of black liquor. The screened yield remained constant and the rejects followed the total yield.

Roe and permanganate numbers increased with increasing amounts of black liquor.

The viscosity followed the Roe and permanganate numbers and increased with increases of black liquor.

The pentosan also increased as if the charge were decreasing.

Burst, tear and time to develop 300 freeness were constant throughout.

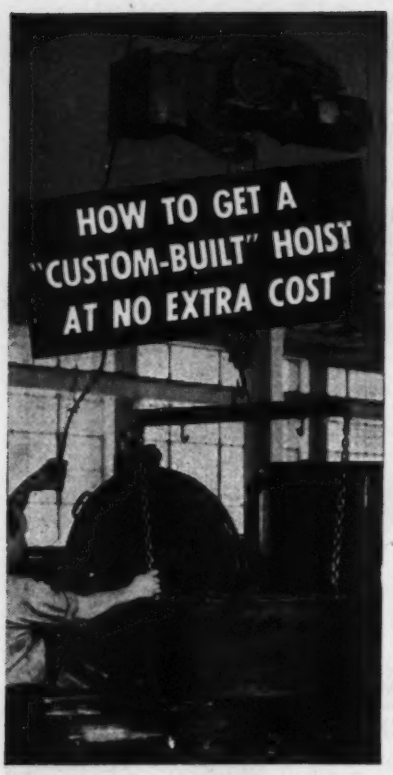
All the properties in series 3 were constant with the exception that burst and tear appeared to increase slightly.

In series 1 with effective alkali increasing it would be natural to assume that such properties as Roe and viscosity would decrease, but these remained constant. Again in series 2 with effective alkali constant, Roe and viscosity increased instead of remaining constant.

Everything points to the fact that, evidence from the titrations notwithstanding, there was an apparent decrease in effective alkali with increases of black liquor. This is substantiated by the fact that in series 1 the pentosan was constant and in series 2 pentosan was increasing with increasing amounts of black liquor. All previous work has shown that pentosan content varies only with effective alkali charge.

In series 2, the decrease in per cent solids removed per gram of B. D. wood, with increases of black liquor is further evidence of decrease in effective alkali.

It was assumed, in series 3, that some of



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the alkali in the white liquor was used up, on cooking, in reacting with organic matter in the black liquor. Therefore, various amounts of black liquor were cooked with white liquor in bombs at 170 C. for 1½ hr. The titrations before and after cooking did show a small uniform difference regardless of the amount of black liquor. Also titration curves showed that for each sample, this difference was uniform from *p*H 12 to *p*H 4.

This difference could only account for small variations in the effective alkali and these variations appeared to be uniform for different amounts of black liquor.

Another assumption can be made for which we have no experimental proof. This is that phenolic compounds in the black liquor may have titrated as alkali but did not react as such.

Whatever the cause, the results however appeared definite. Black liquor when used as a diluent showed by titration an increase in alkali which was not borne out by the yield and quality of the pulp. Therefore, any apparent increase in alkali was counteracted by other properties of the black liquor and no benefit on pulp quality was derived from its use.

Series 3 with effective constant showed uniform Roe and viscosity as would be expected but these results were opposite to those of series 2. There were two main differences, i.e., there were no sulphur compounds in the black liquor; the black liquor was made from single cooks in which there had been no re-use of black liquor, and therefore, it was not nearly so concentrated. In such cases, it is possible that effective alkali will remain in the black liquor as such.

The results are reported for certain conditions and the authors realize that these conditions are far from exhaustive. The work is continuing and it will be some time before a positive statement can be made on any variable to fit all conditions.

**The following abstracts are from papers presented before the Division of Cellulose Chemistry at the meeting of the American Chemical Society, held in Chicago, Illinois, April 19 to 23, 1948**

## Yield and Composition of Hemicelluloses from Maple Holocellulose

**R. L. MITCHELL, S. C. ROGERS, GEO. J. RITTER**
**Forest Products Laboratory, Forest Service U. S. Department of Agriculture**

Hemicelluloses totaling 22.1 per cent of the wood were isolated from maple holocellulose (hemicelluloses plus *a*-cellulose). The hemicelluloses were extracted in four consecutive fractions. The first fraction was removed from the holocellulose by hot water; the second, from the holocellulose residue remaining after the hot-water extraction by means of 2 per cent sodiumcarbonate solution; the third, from the preceding residue by means of 4 per cent sodium hydroxide solution; and the fourth, from preceding residue by means of hot 10 per cent sodium hydroxide solution.

Each of the four hemicellulose fractions, after precipitation from its solution with methyl alcohol, was analyzed for uronic acids, pentosans, methoxyl, and acetyl in order to compare changes in composition among the four fractions. The sodiumcarbonate-soluble hemicelluloses were richest in uronic acids, having 28.9 per cent; the 4 per cent sodium hydroxide-soluble hemicelluloses were richest in pentosans, having 82.7 per cent. Methoxyl was uniformly distributed among the fractions.

The holocellulose residues, after each treatment for extracting hemicelluloses, were analyzed also for determining their hemicellulose and *a*-cellulose content and for integrating the hemicellulose values in the residues with those in the hemicellulose fractions isolated and for following the degradative effects of the various extractions on the *a*-cellulose.

## Hydrolysis of Wood Cellulose with Hydrochloric Acid and Sulphur Dioxide and the Decomposition of Its Hydrolytic Products

**ELWIN E. HARRIS AND ALBERT A. KLINE**
**Forest Products Laboratory, Forest Service U. S. Department of Agriculture**

The rate of hydrolysis of Douglas fir cellulose in dilute hydrochloric acid and in aqueous sulphur dioxide was determined. These rates were compared with those in sulphuric and phosphoric acids, which had been previously determined.

On a molar basis, hydrochloric acid hydrolyzes cellulose at about the same rate as sulphuric acid, while sulphur dioxide gives about one-seventh the rate of sulphuric acid.

The net yield of reducing sugar was not so high with sulphur dioxide as with hydrochloric or sulphuric acid.

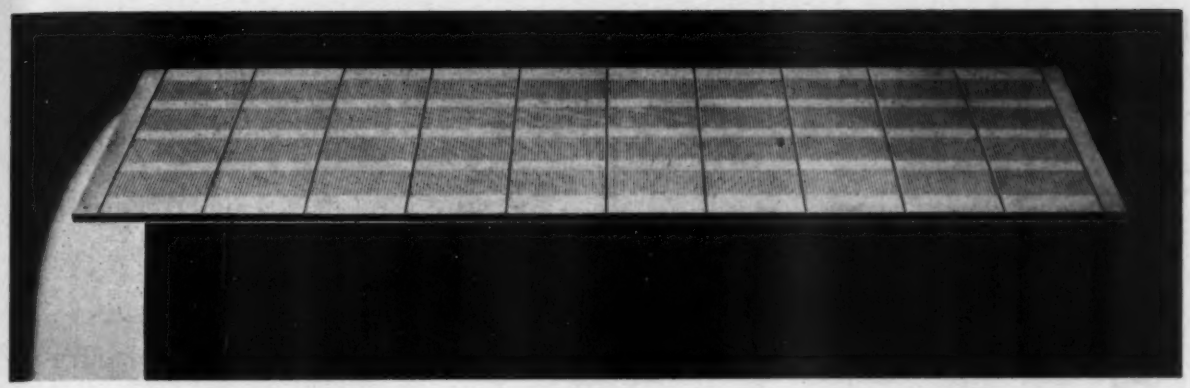
## Investigation of the Properties of Cellulose Oxidized by Nitrogen Dioxide. Effect of All Alkali on the Celluronic Acids

**P. A. McGEE, W. F. FOWLER, JR., C. C. UNRUH, AND W. O. KENYON**
**Eastman Kodak Co.**

When celluronic acids are subjected to the action of dilute alkali, they are degraded with the generation of more acidity. A quantitative study of this production of acidity has been made by means of potentiometric titrations and shows that the relation describing the dependence of extra acidity developed upon hydroxyl ion concentration is:

$$R = A\,[OH^-]^B$$

where *R* is the ratio between moles of extra alkali consumed and initial moles of alkali needed for equivalence and A and B are constants for any given degree of oxidation of the cellulose. No correlation has been found between extra acidity generated at high *p*H and nitrogen content of the sample, nor does atmospheric oxygen appear to play a major role in the degradative process.



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Small amounts of carbonyl groups, in addition to carboxyl groups, have been detected in the celluronic acids. At a constant reaction time the acidity generated in alkaline solution appears to be directly proportional to the carbonyl group contents. Since nitrogen tetroxide is known to react in a highly exothermic manner with aldehydes, whereas certain ketones do not so react, it is tentatively suggested that ketone groups may be present in celluronic acids. Such groups are believed to enolize in alkali, the ene-diols split as in simple carbohydrates the adjacent glucoside linkages hydrolyze and an extensive alkaline degradation is thus initiated which continues along the chain, producing reducing and acidic substances.

## Application of the Tosylation-Halogenation Reaction to a Hydroxyethyl Cellulose

**CLINTON W. TASKER AND C. B. PURVES**

A commercial, alkali-soluble hydroxyethyl cellulose averaging 0.44 mole of ethylene oxide per glucose unit was solvent-exchanged into dry pyridine and tosylated at 20 deg. with excess *p*-toluene sulphonyl chloride. Analyses of the amorphous products isolated after various periods showed that an initial, rapid tosylation was complete within 4 hours and that no further change in over-all amount occurred during 20 days. The products, however, steadily increased in chlorine content, presumably because of a slow replacement of tosyl groups, and lost about two-thirds of the original ethylene oxide units within 4 days.

Samples of the tosylates were heated with sodium iodide in acetonyl acetone or with pyridine hydrochloride in pyridine, thereby replacing most of the tosyl units by halogen atoms. An over-all loss in substitution occurred in these halogenations. The results suggested that the ethylene oxide units in the hydroxyethyl cellulose studied were of two types, one stable and the other unstable to the conditions of the tosylation and halogenation reactions.

### CORRECTION

An omission was made in presenting an abridgment entitled "The Effect on Pulp Quality of the Stepwise Removal and Replacement of the Hemicelluloses from Aspen Holocellulose," by Robert Eugene March, which appeared on page 1833 of the March issue of this magazine.

The following footnote should have appeared with this abridgment:

"A portion of a thesis submitted in partial fulfillment of the requirements of The Institute of Paper Chemistry for the degree of Doctor of Philosophy from Lawrence College, Appleton, Wis., June, 1947. The work was carried out under the direction of Louis E. Wise and Loren V. Forman."

It should also have been stated that Mr. March is connected with the Marinette Paper Company, *Fort Edward, New York.*

## Round Table Discussion. Analytical Methods for Cellulose

**FRED OLSEN, Leader**

At present, the Committee of Standards and Methods of Testing is studying procedures for twenty determinations, which were selected between 1939 and in 1942 as being of the greatest interest to the largest group of users.

Changes in the past six years have probably caused some of these determinations to have less significance, and others, not on our list, to increase in importance, so that revision of the list is desirable.

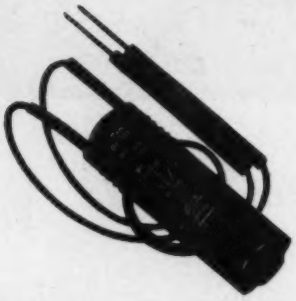
The Technical Association of the Pulp and Paper Industry also has a committee working on analytical methods, headed up by Milton Fillius. Wherever possible we want to collaborate with them on this effort in order to achieve uniform standards. For example, in the viscosity group, we have an interlocking of committees. Peter VanWyck is chairman of both the A.C.S. and TAPPI subcommittees on this problem.

Each member of the division is asked to share his knowledge and experience during this discussion, by suggesting wherein the scope of the work might be advantageously changed, and on what determinations and by what means we can most effectively collaborate with the TAPPI committee on analytical methods. Criticisms and suggestions will be recorded and brought to the attention of the appropriate subcommittees, so that this effort may yield the greatest possible contribution to the Cellulose Division of the A.C.S.

# NEW EQUIPMENT AND SUPPLIES

### Voltage Tester

Ideal Industries, Inc., 4162 Park Ave., Sycamore, Ill., has announced a voltage tester for testing continuity of circuits (a-c or d-c), 110 to 550 volts a-c, 110 to 600 volts d-c, blown fuses, grounded side of line, grounded side of motor or appliance,



excessive leakage to ground, frequency (25 or 60 cycle) and d-c polarity. Indications are by a solenoid indicator and a neon test lamp—each operating independently of the other. Leads are two feet long. Test prod handles are four inches long. The scale is calibrated from 110 to 600 volts.

### Hand Pallet Truck

Sherman Industries, Division of Sallinger-Sherman, Inc., 138 Brookline Ave., Boston 15, Mass., has announced a 2000 lb. capacity hand pallet truck, the *Jack-O-Might*, that is operated by a standard hy-

draulic jack unit, tested to 10,000 lb. static capacity. Two of its four wheels swivel 360 degrees. All wheels are Hyatt roller bearing equipped. The truck will handle all standard pallets and has a lift of 2½ inches.

### Metal Spray Gun

A metal spray gun, the *Mogulectric*, has been announced by the Metallizing Company of America, 1330 W. Congress St., Chicago 7, Ill. Powered with a 1/20 hp. constant speed induction motor, the gun is available for 25, 50 and 60 cycle operation.

The drive component carrying the feed rolls and combustion unit can be swung around from a horizontal spraying position so the gun can spray vertically, up or down or at any angle if desired. The feed rolls can be removed for cleaning if necessary.

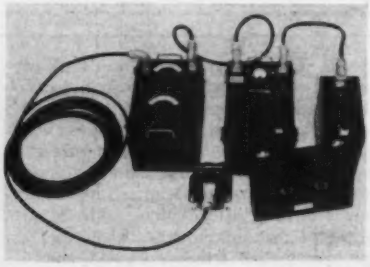
The gas head is a pressure tight bronze casting with removable nozzle seat which

can be replaced if damaged through careless handling. Wire nozzles are made of copper with a hardened steel insert.

To put the gun in operation it is only necessary to turn on the switch and light the gun. The only adjustments required are for gas and air.

### Metal Thickness Gauge

A precision instrument for the measuring of corrosion and wall thickness from one side of metallic surfaces has been announced by the Scott Electroflux Co., Waltham, Mass. Designated as *Electroflux*, the instrument, designed for the non-destructive inspection and testing of metallic



containers, vessels, and piping while in service, is claimed to measure thickness within three per cent of actual thickness. It measures steel thicknesses from 0.125 in. to 2.250 in.

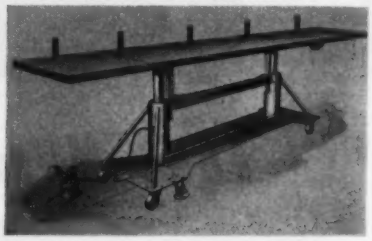
Portable and weighing 55 lb., the instrument combines a 4-electrode probe, a small 6-volt battery, an electronic voltmeter and power supply for measuring the low-voltage output from the probe, and interconnecting cables to permit probe to be moved about at a distance from the metering equipment.

### Sulphonated Fatty Esters

Commercial production of a new series of sulphonated fatty esters from vegetable sources has been announced by E. F. Drew & Co., Inc., Boonton, N. J. The new materials, known as *Sulphonated Estols*, are stated to have excellent color and odor properties, and to be exceptionally free from development of odor and color upon aging. They are available in several grades with properties, according to the announcement, corresponding to various sulphonated natural oils and sulphonated tallow.

### Double Pedestal Hydraulic Sheet Feeding Table

Lyon-Raymond Corp., 4396 Madison St., Greene, N. Y., has announced a double pedestal hydraulic sheet feeding table which is made in capacities of 4000 lb. and 6000 lb. Standard base sizes are offered on which may be fastened tops of



various widths to accommodate the desired sizes of sheets or strips. A 30 deg. tilt top is offered as an optional extra.

A single speed hydraulic foot pump with five feet of flexible hose enables an operator to increase the elevation from 24 in. to 36 in. without moving from his normal working position.

The table is fitted with two swivel casters and two rigid casters. A floor lock secures the table in feeding position as required.

### Protective Coating for Concrete or Steel

Sika Chemical Corp., Passaic, N. J., has announced *Sika-Seal* as a blend of asphalts, plasticizing and adhesive compounds of

painting consistency for application to concrete, steel, wood, and other metal and non-metal surfaces. It is claimed to have excellent adhesion to wet or dry surfaces.

### 1000-Lb. Fork Truck

The Baker Industrial Truck Division of The Baker-Raulang Co., 2168 West 25th St., Cleveland 13, Ohio, has announced the Type FQH-10 center-control fork truck as a truck designed to meet the need for a small light-weight fork truck of 1000 lb. capacity.

The truck has a 36 in. wheelbase and

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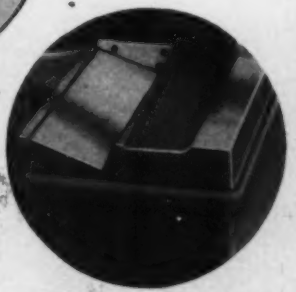

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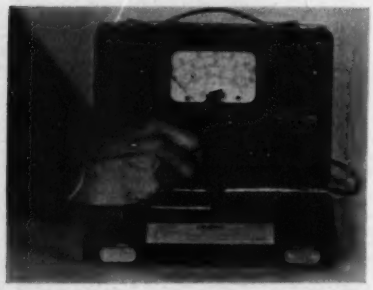
The motor generator type charger is automatic. It is simply necessary to connect the battery to the charger and turn the switch. The charger feeds current to the battery at the proper rate and shuts down when the battery is charged. In case of power failure, the equipment disconnects and restarts when service is restored.

### Precision Tachometer

The Metron Instrument Co., 432 Lincoln St., Denver, Colo., has introduced a new tool to measure speeds of rotation with extreme accuracy for laboratory, test stand and general applications. The new Metron Precision Tachometer is accurate to ¼ per cent of the speed being measured and is of the continuous indicating type, covering wide speed ranges.



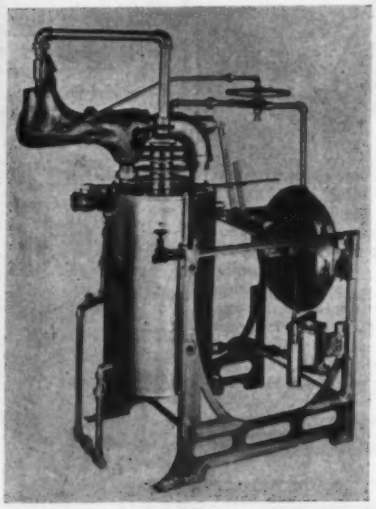
Two types are available, identical except for speed ranges: Type 48H, for speeds of 900 to 10,000 rpm.; and Type 48J, for speeds of 90 to 1000 rpm. Each has ten overlapping ranges, selected by a rotary switch. No damage is incurred by accidental selection of the wrong range.

Metron Precision Tachometers employ an electrical bridge circuit principle, and are self-calibrating. When calibrating, the sensitive speed measuring circuit is matched against internal precision resistors, thus insuring readings against changing ambient conditions.

These high-accuracy tachometers can be used with Metron Type 46 high and low-speed adapters to shift measuring ranges up or down from normal ranges. The tachometer head employs only one rotating part, permanently lubricated for long, trouble-free life. No vacuum tubes are employed, and all parts have essentially unlimited life.

### Fuel-Oil Gas Generator

Vapofier Corp., 10316 South Throop St., Chicago 43, Ill., has announced a gas generator, the *Vapofier*, for producing gas from fuel oil for industrial operations.



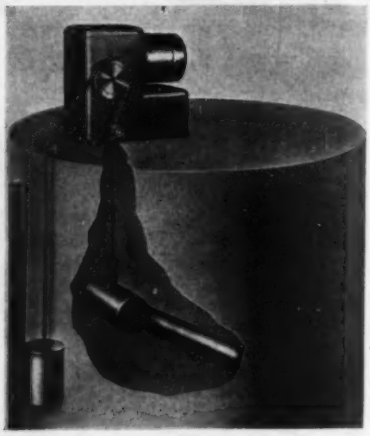
According to the announcement, the generator automatically maintains constant manifold pressure and air-gas ratios from a reducing to an oxidizing flame.

### Liquid Chemical Feeder

A new liquid chemical feeder with several advances over previous designs of feeding devices has just been developed by Liquid Conditioning Corp., 114 East Prince St., Linden, N. J., manufacturers of Liquon equipment and Liquonex materials for all water treatment and liquid conditioning processes.

A primary application of this apparatus, known as the *Liquon Decantrol*, is to feed chemicals either in solution or in suspension (slurry) form to water that is to be chemically treated for softening or clarification. In this service, the unit is equally adapted to either constant rate or proportionating rate control systems of chemical feed.

The Decantrol is a totally-enclosed motor-operated gear-reduction unit of special design, and is mounted on the top of a chemical feed tank. A feeding sprocket engages with a chain, one end of which is connected to the drawoff head of a decanting pipe. The other end of the chain is connected to a level-position indicator which rises as the decanting pipe is lowered. A signal lamp is provided, and lights up during the raising operation, going out when the decanting pipe is at the top position, to notify the operator that the tank is ready for recharging. This signal helps the operator make sure that the plant is not operating without feeding chemicals. The use of a chain and sprocket instead of a cable and drum for controlling the drop of the decanting pipe assures positive non-slip feeding and



eliminates error due to improper winding of a cable on a drum. Either minute or large changes in the feeding rate are easily and quickly made by an adjustable micrometer dial on the reset timer which can be located at any convenient place.

The Decantrol is remotely controlled electrically. This control arrangement permits the meter to be located wherever desired, and also permits greater meter accuracy by eliminating the load on the meter. A synchronous motor is used on the Decantrol. The constant speed at which this type of motor runs, regardless of variations of load and line voltage, assures accurate maintenance of feeding rate.

### Electric Eraser

An electrically-driven hand eraser is being offered by Chicago Wheel & Manufacturing Co., 1101 West Monroe St., Chicago 7. Manufacturer claims that this tool, the new *Handee* eraser effects

smooth, clean erasures without smudge on tracings and drafting room copies in a matter of seconds.

Balanced and shaped to fit the hand, it handles with pencil-point precision. The total weight is but 12 ounces. All moving parts, except the rubber eraser, are com-

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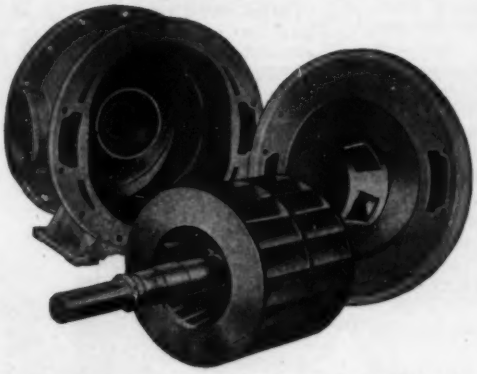

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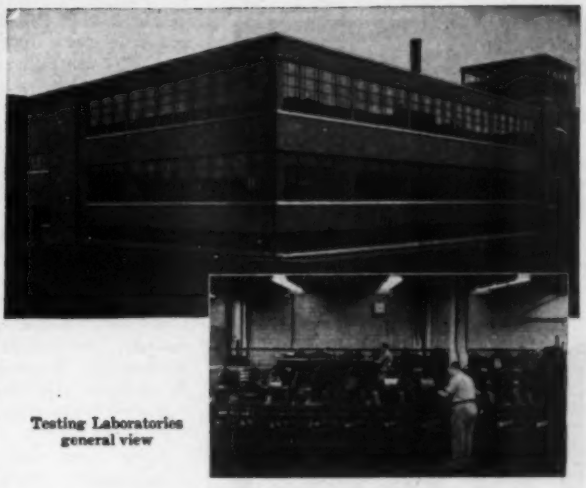

Testing Laboratories general view

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Starting in 1887 with the fundamental question—"what makes packing pack?"—Garlock has extended its research from year to year until the newly constructed building shown above is now required to house Garlock's research activities. Garlock products are developed, improved and refined in these completely modern chemical, physical and rubber-compounding laboratories; thoroughly tested in the fully equipped test department and processed in the pilot plant before ever reaching the production department. This *Quality Control* is your assurance of uniformly high quality in every product sold under the Garlock name.

THE GARLOCK PACKING CO., PALMYRA, N.Y.
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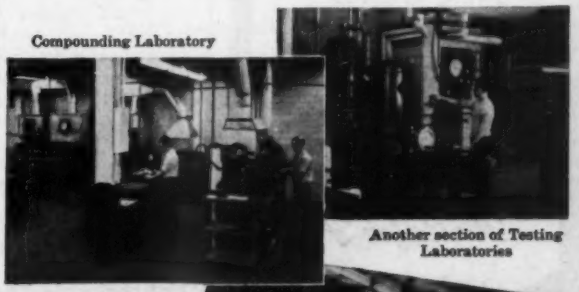
Compounding Laboratory



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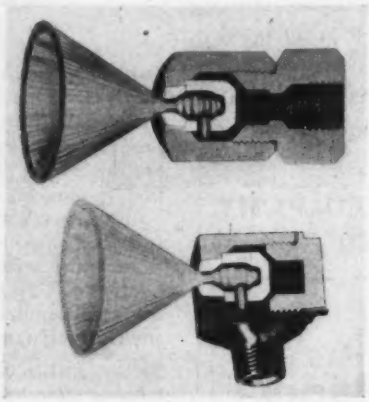
### Whirljet Spray Nozzle

A new Whirljet spray noozle fundamentally new in design, is now being produced by Spraying Systems Co., 4021 W. Lake St., Chicago, Ill. This nozzle is a true Whirljet type, producing a hollow cone spray pattern.

Under tests this nozzle has demonstrated amazing resistance to wear. In this new Whirljet, a vortex chamber as well as an orifice insert are made of tungsten carbide as shown in the illustration. Inlet to



the vortex chamber is drilled on a line tangent to the circumference to provide correct vortex action of the liquid in producing an open hollow cone spray. Nozzle body and retainer cap are made of 18-8 stainless steel. The steel spring holds the vortex chamber in position against the insert; a composition retainer ring provides a tight seal between body and cap. All nozzle parts are precision machined. These new Whirljet nozzles are now available in six standard sizes.

### Unbreakable Thermal Oiler

A new, visible, unbreakable, automatic oiler, to replace ordinary oil cups, specially designed for places where space between oil hole and machinery is very limited has been added to the line of Trico Fuse Mfg. Co., Milwaukee, Wis. The feed spout is arranged to the side instead of dead center, making it possible to mount the oiler where clearance is as little as ¾ in.

The oiler illustrated, automatically lubricates solid, wick, or waste-packed bearings. On the slightest temperature rise, the oiler discharges a few drops of oil. As the bearing receives oil, it cools and the feeding stops automatically. This operation repeats itself constantly and positively without attention. Oil waste, costly down time for frequent hand-oiling, damage to walls and finished merchandise, accident and fire hazards, are eliminated.

The oil supply is always visible and one filling lasts a long time. The reservoir is unbreakable plastic; no cork gaskets to leak; 50 per cent lighter in weight; and all metal parts are bright cadmium-plated

for beauty and easy cleaning. Bottle is removable for easy filling. Made in one, two and four ounce capacities, installation can be made quickly by removing old oil cup and screwing in the ⅛ in. pipe thread adapter shown, furnished with every oiler. This is a companion to the Trico line of thermal oilers now available in a wide range of applications.

### All Stainless Steel Rotameter

A special full-view rotameter with safety shielding for corrosive services is being manufactured by the Brooks Rotameter Co., Lansdale, Pa. Ordinarily a meter of this type has the internal metal parts in contact with the fluid made of stainless steel, or other special metals. This particular meter has all external metal parts also made of stainless steel. These parts include the side plates, window frames, gland followers, cap screws and gland bolts. Hence the meter withstands external corrosive action as well as internal corrosion. It is made with screwed connections in sizes ¼ in. to 1½ in. and with flanged connections in sizes 1 in. to 3 in. It will measure flow rates as high as 120 gpm of liquid or 240 cfm of gas.

### Safety Floor Covering

A plastic-abrasive composition which can be troweled on to any surface is being introduced by American Abrasive Metals Co., Irvington, N. J.

This material, known as *Ferrox* Anti-Slip Troweling Composition, is the same safety floor covering used by the Navy during the war. Outside weathering and oil do not affect it. One gallon covers 40 sq. ft. and it costs very little. It is available in five colors.

Ferrox is recommended for slippery areas in factories, outdoor ramps, walks, loading platforms, etc. It may be applied to wood, stone, concrete, steel, and other metals.

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# TECHNICAL DEVELOPMENTS

**These abstracts are of the latest developments found in the American and foreign press.**

## The Paper and Board Industry in India

The developments in the large scale manufacture of paper in India are traced. In 1925, the government acted to protect the writing and printing paper industries, and existing mills were reconstructed and modernized.

In 1946, the total production of India reached a total of 120,757 tons of board and paper. In 1951-2, the writer estimates that the demand will be 355,000 tons. He gives prewar figures and estimates of various sources of pulp. Bamboo is an excellent papermaking material, but it is quite possible that the large supplies of spruce and fir in the regions of the Himalayas may be used. It is even suggested that woods might be pulped in the hills and the pulp piped down. At present investigations are being made on the more readily available angiosperms that can be used for pulping. M. P. Bhargava. *Indian Pulp and Paper* 2, No. 1, 9-11 (1947); through B.I.P.C. 18, No. 3, 175.

## Characterization of Pulps Used for Fine-Thread Spinning Papers

The author found that a certain unbleached strong sulphite pulp (I) formed an excellent fine-thread spinning paper, and so he examined the various properties of this pulp in the hope of obtaining criteria that could be used in evaluating other pulps that might be used for the same purpose. Details of his investigations are given. (I) which had a Sieber no. of 60, and which contained 6.4 per cent "wood gum," showed unusually high strength properties, even when tested prior to beating. Using the standard German techniques, the degrees Schopper-Riegler rose sharply within the first half hour of beating, and then flattened out after about (a total of) 50 min.

The maximum strength properties usually developed very early in the beating operation, the highest tensile and bursting strength being reached within the first 20 min. and the maximum Brecht-Imset tearthrough developed within the first 10 min. of beating. Relative wet strength rose rapidly after the first half hour, and the highest folding endurance (8444 double folds) developed after about 50 min., although this was not very far above that obtained within 20 min. The author gives a number of curves and tabulated data which are discussed. Walter Brecht, *Das Papier* 1, 216-18 (1947) (In German).

## Cellulose Parchmentation

The action of zinc chloride and of sulphuric acid on cellulose was studied, and X-ray examinations of the products were made. The salt does not always penetrate uniformily into the pulp used, and under certain conditions of temperature and concentration a compound is formed between the zinc chloride and the cellulose. Swelling of those celluloses that are less suitable for parchment formation appears to be more rapid than for others. Mercerization of the fibers leaves them less suited to successful vulvanization with zinc chloride. Germano Centola. *Ind. carta* (Milan) 1, No. 2, 1-4 (1947) (in Italian) (a report from the Experiment Station for cellulose, paper, vegetable fibers and artificial fibers, at Milan), Through C. A. 41,7745.

## Barium Carboxymethylcellulose and Its Uses

The barium salt of carboxymethylcellulose is prepared by precipitating the alkaline metal salt (in aqueous solution) with alcohol. This salt has very characteristic properties and is a thixotropic colloid. It may be used in the determination of certain cellulose ethers. It has good film forming properties, furnishes a greaseproof coating for paper and board, and may be used as an ingredient in paints and in printing inks. When treated with dilute sulphuric acid or with alum, it has possibilities as a sizing agent for paper and for textiles. Sven Sönnerskog. *Svensk Papperstidn.* 50, No. 19, 445-6 (1947) (The original is in English).

## Raw Materials Lost in the White Water of the Paper Industry

The author has made a study, by means of comprehensive analyses, of substances lost in the white waters. He estimates that (depending on the operations used) 1-12 per cent fibrous materials, 5-35 per cent fillers, 10-45 per cent rosin, 30-50 per cent starch, and 30-66 per cent animal size are lost. In order to obtain representative white water samples automatically and at suitable intervals, the author built a special triangular overthrow weir, the construction and use of which are described in detail together with a sketch. This not only permitted him to obtain samples, but gave him the means of computing the total 24 hour volume of white water of the mill.

Ordinarily the following fractions were separated, and various components in each fraction were determined: (I) the total solids obtained on evaporation and on drying; (II) total filterable solids obtained prior to flocculation; (III) filterable material after flocculation. Each of these fractions could then be analyzed for organic and inorganic matter, and for whatever specific determinations seemed pertinent. In the case of (III), one liter of the white water was treated at 55 deg. with 50 cc. of a standardized calcium resinate solution and flocculated by the addition of a definite volume of 5 per cent papermakers alum at *p*H 4.4. When the flocculation was complete, the mother liquors were decanted and the floc filtered and dried to constant weight.

It was absolutely essential to run a control experiment with one liter of a representative sample of the original mill water and to subtract any floc thus obtained from that formed in white water. Similar control experiments were made throughout this study—thus allowing corrections to be made for components in the mill water (which would also appear in the white water). Inasmuch as (II) could be determined directly by filtration, and as the above "floc" gives both (II) and (III), an evaluation of (III) can be arrived at by subtracting (II) from the combined weights of the two. This represents the colloidal matter in the white water.

The author outlines precautions that must be taken in drying and ashing (I), and discusses methods for estimating rosin, waxes, starch, animal size (or casein) in the white waters. In determining rosin losses, it may be expedient to take into consideration the resins present in fibers carried into the white water. This resin may then be subtracted from the total rosin found. However, such corrections are difficult, and not too accurate. Methods for determining ash are given in some detail and here too it is essential to take into account the mineral components present in the mill water. The author refers to methods previously described in the literature, and outlines means for reducing raw material losses. Hanns Arledter, *Das Papier* 1, 210-15 (1947) (In German).

## Cellulose Acetate from Wood Pulp

Wood pulps lead to a cellulose acetate that has 2-3 times the color of the product from cotton linters. It has a lower tensile strength and shows turbidity in solution. The author discusses possible methods for improving the product. Carl J. Malm. *Svensk Papperstidn.* 50, No. 11 B. 135-7 (1947) (in English) (through C. A. 41, 7110 (1947).

## A Homogeneous Test Solution for Determining Copper Numbers

As a substitute for the usual two solutions required in making up Fehling solution, an individual reagent was devised. This is prepared by the addition of 30 g. crystallized copper sulphate, 50 g. sodium hydroxide, and 150 g. triethanolamine to one liter of distilled water. The solution may be used in determining the copper numbers of bleached and unbleached chemical wood pulps, cotton linters and rag stock, and the results compare very favorably with those obtained with Fehling solution.

In the analysis, about 1 gram of air-dried material in finely divided form is added to 40 cc. of the solution at its boiling point. The suspension is then heated for exactly 3 minutes, filtered promptly, and washed with 750 cc. water. In other respects the copper number determination is identical with those previously described in the literature. When kept in dark bottles, the homogeneous reagent remained unchanged for several months. Its advantage is that the analyst can deal with one instead of two solutions. August Noll, *Das Papier* 1, 109-112 (1947) (In German).

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# Butterworth Calender Rolls

# New Catalogues and Publications

**Allis-Chalmers Mfg. Company,** Milwaukee 1, Wis.—The unusually wide range of equipment made available to the pulp and paper industry by this company is graphically portrayed in its new 32-page Bulletin 25B6827 by an index which lists more than 100 classifications. Flow sheets and illustrations are used extensively. The bulletin also describes the company's contribution to better woodroom and wet room machinery. Also available is Bulletin 11B6935 which covers Allis-Chalmers multicircuit unit substations and their economy, safety and adaptability features. Construction highlights of the load ratio equipment and the metal-clad switchgear are also described.

**American Abrasive Metals Co.,** Irvington, N. J.—A circular describing Ferrox anti-slip troweling composition for floors, ramps, etc., may be obtained from this company.

**American Flexible Coupling Co.** (Division of J. A. Zurn Mfg. Co.), Erie, Pa.—The functions of flexible couplings are described in a 24-page, three-color booklet published by this company, entitled "Relief from Bearing Wear Grief." It tells how many plants are preventing waste of time caused by bearing failure, shaft failure and damaged equipment through improper coupling of rotating shafts. Practical help is given design engineers, plant engineers, master mechanics and maintenance men. Descriptions and illustrations show how the operation of American Flexible Couplings compensates for end thrust and the three types of shaft misalignment. A section of the booklet contains information on the maintenance and renewal of the American Flexible Coupling.

**Armstrong Machine Works,** Three Rivers, Mich.—Available upon request is Bulletin 184, describing ½ in. to 2 in. cast semisteel Y-Type Pipe Strainers for steam, gas, air, water and oil lines. The single-sheet bulletin gives detailed information on strainers with either perforated brass screens or fine mesh woven stainless steel screens.

**John B. Astell & Company,** 90 W. Broadway, New York 7, N.Y.—A new two-color folder describing the fabrication of Robinson light wall stainless steel fittings has been released by this company. Photos of each type and chart of standard sizes are included. Another bulletin discusses the application of its stainless steel pipe, tube, and fittings to industries where various types of corrosion are encountered, such as the paper and pulp field.

**W. H. and L. D. Betz,** Philadelphia 24, Pa.—Furnished free upon request to this company is Technical Paper No. 110. It is a reprint of an article entitled "Substitutes for Soda Ash in the Treatment of Boiler Feed Water."

**Chromium Corporation of America,** 120 Broadway, New York 5, N.Y.—A revised catalogue designed to provide helpful information for successful applications of industrial chromium plating has been made available by this company. The 36-page, profusely illustrated publication outlines the characteristics of chromium plating and devotes several pages to various specific applications including paper mill machinery. Tables and charts complete the catalogue.

**Cochrane Corporation,** 17th St. & Allegheny Ave., Philadelphia 32, Pa.—This company has announced the publication of three new bulletins. One is an expanded 20-page bulletin on high pressure condensate return systems. New technical material on turbulent versus laminar stem flow, and the effects of air and condensate films on heat exchange characteristics, make the technical portions of this booklet particularly useful to engineers responsible for the efficient transfer of steam heat in heating, cooking, drying and processing operations. Improved equipment for the positive removal and drainage of condensate is also described for the first time. Typical case histories are included. Ask for Publication 3250. Another 12-page booklet, No. 4425, Cochrane Rapid Reactors, describes its recently announced cold process softener. Detailed explanations of the process and the operation of the equipment are given. Chemical proportioners, filters, etc., are described and illustrated. Two typical installations are included. The third bulletin, No. 4340, describes Cochrane Multiport Drainers. Capacities, dimensions, construction data and list prices are given. These bulletins may be had from the above address or from Canadian Allis-Chalmers, Ltd., 212 King St., W. Toronto, Ont., Canada.

**Combustion Control Corporation,** 77 Broadway, Cambridge 42, Mass.—In their Bulletin FF-1, descriptive of its Photo-Electric Combustion Safeguard, which provides complete starting and operating protection for industrial oil burners, is included Bulletin CB4751, with specifications and installation sheet for the Fireye photoelectric scanner, and Bulletin CD4751, on Fireye Programming Control. All are available upon request.

**Denver Equipment Company,** P.O. Box 5268, Denver 17, Colo.—Descriptive of its testing sieve shaker and vibrating screens for laboratory use, is Bulletin LS5-B. Specifications and illustrations of its new bolted steel tanks appear in Bulletin T2-Br.

**Henry Disston & Sons, Inc.,** Philadelphia 35, Pa.—A complete revision of the popular Disston Saw, Tool and File Manual has just been released by this company. The manual, which was first issued in 1921, describes some of the more important tools used by the craftsworker and tells how to use and care for them. The 1948 revision contains 64 pages instead of the previous 48.

**The Dow Chemical Company,** Midland, Mich. —Just released by this company is a Technical Service Bulletin entitled "Ethocel Hotmelts for Paper Coatings," which contains descriptions of these hotmelts, their application, and the properties obtained when used on papers. The 15-page bulletin is available at Dow offices throughout the coutry or many be obtained by writing to the Coatings Section, Plastics Division of the company.

**E. I. duPont de Nemours and Company, Inc.,** Wilmington 98, Del.—A new du Pont booklet "Elvanol Polyvinyl Alcohols" describes the physical and chemical properties, commercial grades, use and application of this series of versatile resins. The booklet gives a summary of major industrial uses including paper sizing and coating. Modifications of "Elvanol" are discussed fully in the new booklet as are also compatible extenders and dyes, and the physical and chemical properties of the various grades.

**The Engineer Company,** 75 West Street, New York 6, N.Y.—Power plant engineers may obtain from this company Drawing 2223-B of its wide range mechanical atomizer for oil burners. Accompanying the drawing are descriptive notes and illustrated sheet.

**Eutectic Welding Alloys Corporation,** 40 Worth St., New York 13, N.Y.—Designed to show weldability of several thousand major and minor commercial alloys, as shown by type of weld, equipment design and practical application of special gas and welding rods, a condensation of a United States and Canada engineering survey has been published by this company. Ask for the 1948 Eutectic Welding Directory. Also available is an illustrated 8-page bulletin on a low-cost surface and underwater metal cutting tool, known as "Cut-Trode," which employs electric arc vapor. A third technical bulletin, "Eutectic Welder: Overlay Issue," describes for the first time specific procedures involved in industrial equipment salvage welding with various gas and arc rods for producing hard overlay at low temperature. New alloys for the hard overlay process are featured analytically by charts and photographs.

**Fostoria Pressed Steel Corp.,** Fostoria, Ohio. —Information on cost cutting through improved lighting may be had from this company by writing for its folders, "Balanced Lighting," and "Improved Lighting." Data on procedure and guides for footcandle levels are included, as well as illustrations for various lighting applications.

**General Electric Co., Apparatus Dept.,** Schenectady 5, N.Y.—A valuable reference book for the paper and pulp manufacturer is the new booklet issued by this company, "Specialized Testing and Measuring Equipment Catalogue." Products are grouped under functional or "use" headings, such as "Time, Speed and Torque." The catalogue also includes reference numbers for each item by which more detailed information can be obtained.

**W. & L. E. Gurley,** Troy, N.Y.—Recently published by this company is a booklet describing its motor-operated stiffness tester, which can be used in testing paper and other materials. Booklet shows range and capacity. Ask for Bulletin 1430.

**Hydro-Power, Inc.,** Belmont and Sheridan Aves., Springfield, O.—Just published by this company is a bulletin describing its complete line of radial piston-type hydraulic pumps supplying pressures up to 3,000 psi. It includes dimensional charts, characteristic horsepower volume pressure curves, and descriptions of the three types of available control. One of the specific applications of this pump is to a paper-making machine. Ask for Bulletin 471.

**The International Nickel Company, Inc.,** 67 Wall St., New York 5, N.Y.—A newly revised and enlarged edition of Bulletin P-1, "The Properties of Heat Treated Wrought Nickel Alloy Steels," is available. It contains much new data on the properties of the more commonly used engineering steels containing up to 5 per cent nickel and information on heat treatment methods, both for carburizing and direct-hardening compositions.

**The Jeffrey Manufacturing Company,** Columbus 16, Ohio.—A new catalogue, No. 803, covering the complete line of Spiral Conveyor and Fittings and its application, how to specify, horse power formulas, etc., is now available. All equipment listed follows the new industrial standard dimensions established by the industry.

**E. D. Jones & Sons Company,** Pittsfield, Mass.—Three new bulletins have been issued by this company. The 12-page Bulletin No. EDJ-1012, with Maintenance Data, furnishes leveling, setting, lubricating and refilling instructions for users of the Jones High-Speed Refiner. The bulletins, EDJ-1009 and EDJ-1015, describe the constructional features and installation of the Jones Double Wedge Greylock Jordan Shell Filling, Jones Patented Nowave Plug and Shell Filling, and new Jones Type-W Jordan Plug.

**Koppers Company, Inc.,** Wood Preserving Division, Koppers Building, Pittsburgh 19, Pa. —A new 12-page booklet on fire retardant wood discusses "Fire hazard" ratings of various building materials, evolution of fire retardant treatments, Underwriters' Laboratories tests and applications of fire retardant wood. It also contains standard specifications for fire retardant treatment with the new CZC (FR), developed by Koppers.

**Liquid Conditioning Corporation,** 114 E. Price St., Linden, N.J.—Bulletin No. 13, on "Liquonex Ion Exchangers," is of special interest to engineers and operators of plants using or considering the installation of new ion exchange equipment or replacement of such equipment. It describes the Liquonex cation zeolites and anion exchangers. Explanations of the correct applications, advantages and characteristics of many types of resin, greensand and synthetic gel zeolites to assist in securing correct selection for specific water conditions and plant requirements are given. Another bulletin, No. 14, on "Decantrol and Other Chemical Feeders," is also available. It explains the purpose and applications of the different control systems for feeding chemicals to raw water to correct and eliminate impurities, and describes the various types of apparatus available. The booklet is illustrated with drawings and photographs showing the principles of design and operation of the different types of feeders. Address Dept. PA of the above company.

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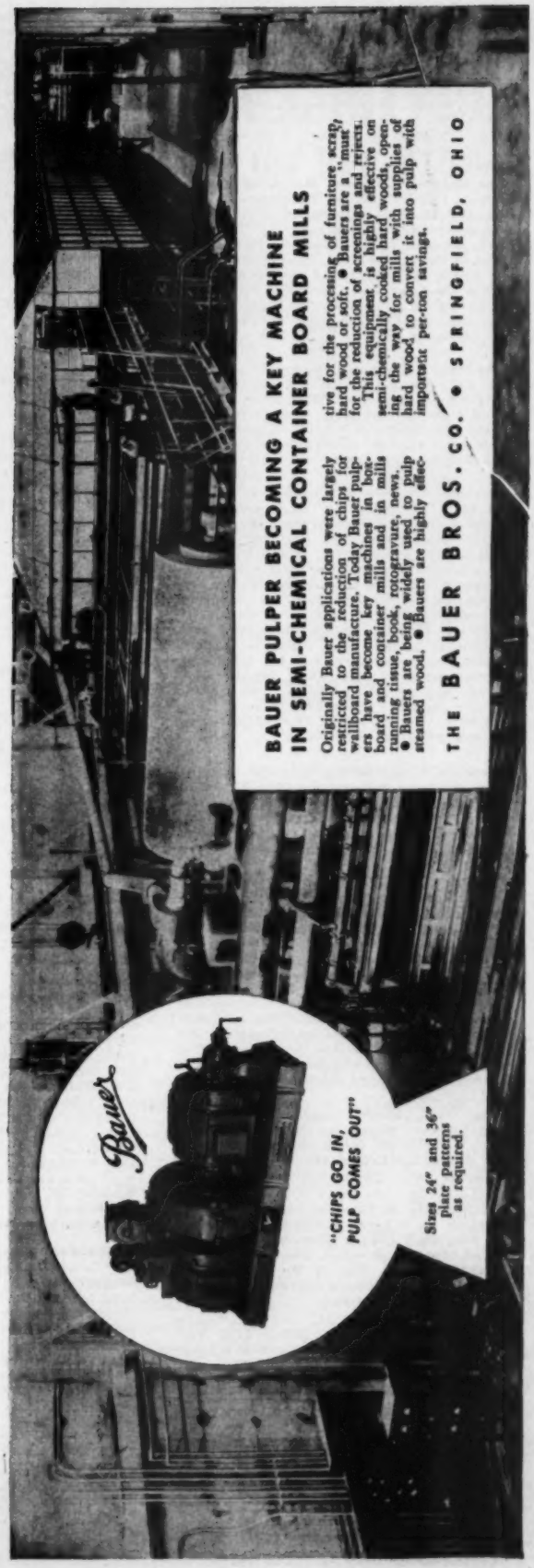
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**Lyon-Raymond Corporation,** 5298 Madison Street, Greene, N.Y.—Bulletin No. 211 is now available describing and illustrating the new Lyon-Raymond Single Stroke Lift Truck which is offered in one standard capacity of 2500 lb. and in varying heights and platform sizes. Another bulletin, No. 260, describes the Lyon-Raymond Hydraulic Strip and Sheet Feeding Tables. Practical applications and specifications of different models are listed.

**The Magnesia Insulation Manufacturers Association,** 1317 F St., N.W., Washington 4, D.C. —Available from the association at the above address are reprints of a paper by Utley W. Smith, manager of the association, which appeared in the October, 1947, issue of the American Society of Heating and Ventilating Engineers Journal Section of Heating, Piping and Air Conditioning, entitled, "A Rapid Method of Determining the Economical Thicknesses of Pipe Insulation."

**The Miranol Chemical Company, Inc.,** 2 Ford Ave., Milltown, N.J.—A booklet describing its ten Miranol detergents and wetting agents may be had from this company. Some of these detergents are of special interest to paper manufacturers. Ask for their bulletin on "Synthetic Organic Detergents."

**National Adhesives,** 270 Madison Ave., New York 16, N.Y.—Copies of a new booklet, "How to Prepare and Use Glues, Pastes and Gums," may be secured from this company. It is a revision of a similar booklet first printed in 1939. Helpful information on the storage and handling of all types of adhesives is given, including recommended methods of removing the contents from various types of containers. There are chapters on the preparation and use of many types of glues, pastes, lacquer adhesives, Resyn emulsions, and the mixing of different types of cold water soluble paste powders and cook up adhesives. Other chapters are devoted to discussion of such terms as fluidity, viscosity, solids, etc., together with the basic principles of adhesion.

**Northern Equipment Co.,** Erie, Pa.—A booklet on the Copes Pressure Reducing Valve has been issued by this company. Detailed descriptions of the valves are illustrated with photos, sectional views and schematic drawings. Tables of specifications are also included. Ask for Bulletin 477.

**Ohio Gear Company,** 1334 E. 179th St., Cleveland 10, Ohio.—A new type of stock gear and reducer catalogue has been released by this company. It is divided into sections on reducers, gears, chains and sprockets, and includes more than 120 pages of engineering data, tests, ratings, ratios, formulas, tables and costs. Performance and informational material have been simplified. The catalogue is file size and illustrated in two colors. The booklet will be of practical help to designers, engineers and those responsible for the maintenance and equipment of machines and drives.

**The Ohio Injector Company,** Wadsworth, Ohio.—A new 16-page catalogue is available which describes the design, ratings, and markings of its full line of 600 lb. Forged Steel Valves in gates, globes, angles and checks.

**E. W. Pike & Company,** 492 North Ave., Elizabeth 3, N.J.—A complete catalogue on the Pike Flash-O-Lens, illuminated magnifier for all types of inspection, has been published by this company. One of the uses for this magnifier is for accurate determination of paper markings and quality.

**Precision Equipment Co.,** 2658 N. Long Ave., Chicago 39, Ill.—Now available is a six-page circular listing steel shelving and other office equipment.

**Pulverizing Machinery Company,** 240 Chatham Road, Summit, N.J.—A new illustrated bulletin entitled "Optimum Recovery with the Mikro-Collector," has been announced by this company. Filter rates, dimensions, weights, and other details are fully covered.

**R-S Products Corporation,** Wayne Junction, Philadelphia 44, Pa.—Comprehensive coverage of Disc Type Valves is given in a 52-page volume just released by this company. There are over 70 specially made half-tone photographs, as well as tables keyed to drawings showing dimensions of valves. A special section is devoted to prime movers. The catalogue has been designed to be of practical use to engineers. An excellent index adds to the value of this valuable reference booklet.

**Robins Conveyors Division, Hewitt-Robins, Inc.,** Passaic, N.J. The necessary information for laying out a belt conveyor system is contained in a new bulletin on Robins Idlers which has just been issued. This booklet, No. 120-A1, is an amplification of a previous issue, incorporating important changes in engineering details. It also points out the special features of Robins Idlers. Copies available on request to the above address. Another new publication is a descriptive folder on Ajax and Conservo hose, stressing "job-engineered" features, which has just been released by the Hewitt Rubber Division of Hewitt-Robins, Inc., Buffalo, N.Y. This can be obtained by addressing the Hewitt Rubber Division, Hewitt-Robins, Inc., 240 Kensington Ave., Buffalo 5, N.Y.

**St. Regis Paper Company,** 230 Park Ave., New Yotrk 17.—The latest in the series of "Case Histories" published by this company is its Bulletin 18, which describes its packaging system, a combination of a valve bag filling machine and multiwall paper valve bags.

**Sarco Company, Inc.,** Empire State Bldg., New York 1, N.Y.—The company's new steam and water mixer to provide hot water at isolated points is described in Catalogue 900. In two colors, the cut-away photographs show operation, installation, and construction. Convenient capacity and dimension tables are included.

**George Scherr Company, Inc.,** 200 Lafayette St., New York 12, N.Y.—This company has published a 6-page folder fully describing models A and B of the Wilder Micro Projector. Illustrations show the instrument in use in highly diversified types of work and also a number of accessories.

**Sika Chemical Corporation,** 35-49 Gregory Avenue, Passaic 2, N.J.—A new folder on the quick-setting compounds, Sika No. 2 and Sika 4A, is available. Pictures show the sequence of application and instructions for use under various conditions.

**Taylor Forge & Pipe Works,** P.O. Box 485, Chicago 90, Ill.—A helpful bulletin with complete listings of dimensional data on stainless steel welding fittings and flanges is now available from this company. Diagrams are also included. Ask for Bulletin No. 476.

**The Thew Shovel Company,** Lorain, Ohio.—An illustrated booklet, "Modern Logging with Lorains," shows the use of power cranes and shovels in the logging and lumber industries. Correct handling of pulpwood in paper mills is illustrated by two pages of photos.

**Westinghouse Lamp Co.,** Bloomfield, N.J.—Announced by this division of the Westinghouse Electric Co., is a 24-page booklet describing 16 types of mercury vapor lamps. Detailed information is given on electric discharge through vaporized mercury; technical data for the various types of vapor lamps; spectral radiation characteristics of vapor lamps at different arc pressures; auxiliary equipment available; operating characteristics of such lamps; lamp construction; lamp life and lumen maintenance; effect of ambient and lamp temperatures on lamp life, and application information. Write to the Advertising and Sales Promotion Department, Westinghouse Lamp Division, Bloomfield, N.J.

**Wheelco Instruments Company,** 847 W. Harrison Street, Chicago 7, Ill.—Upon request, the company will furnish Bulletin F1-1, which contains illustrations, wiring diagrams and a complete description of Wheelco Flame-otrol Combustion Safeguard Systems. The 12-page, two-color bulletin lists models with recommendations for application.

**Yale & Towne Manufacturing Company,** 4530 Tacony, Philadelphia 24, Pa.—Just issued by this company is a three-color, 30-page bulletin on its complete line of Worksaver electric trucks. Described and illustrated in detail are the operating mechanisms of these trucks. Each of the seven types is then described and illustrated. Recommended uses, capacity, weight, battery characteristics, speeds, dimensions, electrical characteristics, mechanical characteristics, etc., are given. Different types of rectifiers and motor generator chargers are also described. Application photographs show trucks used for handling paper, pallet-bins, cores, etc. Ask for Bulletin P809.

**Zaremba Company,** Buffalo, N.Y.—An 80-page catalogue which lists the accomplishments of this company, and the facilities of its associated companies, has been released. It also gives full information on its line of evaporators and similar equipment. Many of the photos of applications will be of interest to paper and pulp manufacturers.

---

**Fisher & Porter Co., Dept. 1A-7,** Hatboro, Pa.—Users of high pressure flow rate instruments are eligible to receive a new technical bulletin on this subject. Included in the digest are data relating to selection, design, and dimensions of a variety of flow rate instruments suitable for high pressure and high temperature operation. Details of the "in-a-line" design reportedly capable of reducing weight and dimensions of the meter body as well as making the installations simple. Recording, controlling, integrating, remote and close coupled instrument accessories are also shown.

**General Electric Co.,** Schenectady, N. Y.—A bulletin now available describes the new tri-clad vertical induction motors for pump drive. It is well illustrated with photos, cutaway views and charts. Also included are tables with information on types of lubrication and standard coupling and "P" base dimensions. Write Apparatus Department, General Electric Co., Schenectady, N. Y.

**The B. F. Goodrich Co.,** Akron, Ohio. —Now available upon request from this company is a new 28-page booklet, No. 9, "Typical Examples of Development in Rubber and Koroseal." In the booklet are reproduced 26 case history advertisements that have appeared in recent months, showing the part played by research and development in solving problems for customers. One of these is a cord belt for conveying logs to the pulp grinding room in a paper mill, and another case shows the Plylock Belt Joint for use in paper mills.

**Leslie Company,** Lyndhurst, N. J.—Just released by this company is a 20-page illustrated booklet, "Engineering, Operating and Maintenance Data on Pressure Controllers, External-Pilot-Operated." Large cross-sections are used to show design features of control pilots and associated diaphragm regulating valves. To guide in the selection of equipment for specific applications, selection charts and capacity tables have been provided. Instructions for installation, operation, and maintenance are also presented in easy-to-follow sequence. Write to the company at 159 Delafield Avenue, Lyndhurst, N. J., for Bulletin No. 462.

**Manheim Manufacturing & Belting Co.,** Manheim, Pa. — Available to inquirers by the end of June will be a new Veelos V-belt catalogue. It describes features of adjustable V-belts, construction details, and also illustrates methods of coupling and uncoupling, measuring and installing. The catalogue contains engineering data and 13 pages of application photos, showing installations in various industries including pulp and paper manufacture.

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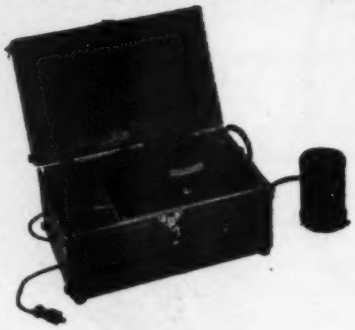

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|---|---|
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| Trouble on the Paper Machine | .75 |
| Pulp Bleaching (A Symposium) | .50 |
| Technology of Papermaking Fibres | .50 |
| Lessons in Paper Making—Part 1 | .75 |
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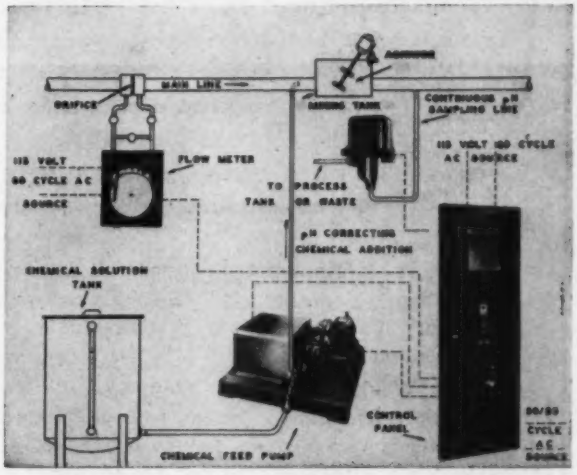
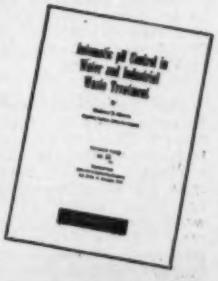



**Automatic pH Control as shown is a recognized necessity in many fields, including water treating, pharmaceutical manufacture, paper making and chemical processing.**

Milton Roy Chemical Pumps are positive metering units. Because of the high degree of accuracy of volumetric measure made possible by the Milton Roy step valve design, these pumps have found many applications as components of automatic chemical feed systems.

In the system shown, for example, the capacity of the Milton Roy Pump is automatically compensated for two variables—rate of flow and pH value. Pump motor speed is directly proportional to rate of main line flow and length of stroke of the pump is automatically adjusted by the pH controller. Thus the pH controller is only required to follow changes in chemical characteristics of the system, eliminating "hunting" and resulting in uniform pH correction.

The necessity for constant and automatic pH control is well recognized in many applications including water treatment, pharmaceutical manufacture, paper making and chemical processing.



For further details on pH control equipment and other automatic Milton Roy Chemical Feed Systems for various applications write for Catalog No. 146, Bulletin No. 468 and other literature.

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## Books

**Air Conditioning**—Authored by Herbert Herkimer, Consulting and Industrial Engineer, and Harold Herkimer, Design Engineer and Project Manager, Raisler Corporation, this book of more than 700 pages is divided broadly into two parts. The first part of the book reviews the laws of chemistry and physics associated with the science of air conditioning. The second part treats the more practical aspects of the subject, e.g., equipment, material and costs. Representative of the subjects treated in the 24 chapters of the volume are the following: Gas Laws; Physical and Chemical Properties of Matter; Heat and Heat Transfer; Elementary Thermodynamics and Steam Air and Vapor Mixtures; Fans, Ducts, and Air Distribution; Heating Load; Cooling Load: Drying; Unit Air Conditioners; Industrial Applications; and Estimating Costs. Published by Chemical Publishing Co., Inc., 26 Court St., Brooklyn 2, N. Y., the book is priced at $12.00 a copy.

**The Chemistry and Technology of Waxes**—Alvin H. Warth, Chemical Director, The Crown Cork and Seal Co., Baltimore, Md., is the author of this volume. In the foreword, he states that his chief purpose in preparing it has been to provide a ready reference work for chemists and industrialists who require a knowledge of waxes in the line of endeavor, and for those students and technicians who may wish to extend their background in a field with which they are not familiar. The text is divided into nine chapters: namely, Introductory; Chemical Components of Waxes; The Natural Waxes; Fossil Waxes, Earth Waxes, and Lignite Paraffins; Petroleum Waxes; Synthetic Waxes and Wax Compounds; Emulsifiable Waxes, Waxy Acids and Metallic Soaps; Methods for Determining the Constants of Waxes; and Wax Technology—Uses in Industry. The book is completed with an appendix, an author index, and a subject index. Totaling more than 500 pages, the book is priced at $10.00 a copy. Reinhold Publishing Corporation, 330 W. 42nd St., New York 18, N. Y., is its publisher.

**The Chemistry of the Carbon Compounds (The Heterocyclic Compounds and Organic Free Radicals)**—This volume, which is Volume IV of a series, is a literal translation from the twelfth German edition of Victor von Richter's work on the subject. It treats of the heterocyclic compounds (which constituted the third volume of the German original) and of free radicals (part of Volume II, Part 2, of the German original). The original text covering heterocyclic compounds was written by F. Reindel; that covering the organic free radicals, by Ludwig Anschütz. The translation, editing, and checking of the original text covering the heterocyclic compounds for the present volume was done by M. F. Darken; while similar work on the text covering organic free radicals was done by A. J. Mee. With the publication of this volume, the entire twelfth edition of the original German work becomes available in English translation.

The book is priced at $12.00 a copy by its publisher, Elsevier Publishing Company, Inc., 215 Fourth Avenue, New York 3, N. Y.

**Directory of Commercial and College Laboratories** (Miscellaneous Publication M 187—superseding miscellaneous publication M 171) — Information is given in this paper-covered brochure about 220 commercial laboratories, and 189 college laboratories used for research and testing as well as instruction. Listings are arranged both alphabetically and geographically in two sections—the first covering the commercial laboratories, the second, the college laboratories. Compiled by Ann E. Rapuzzi under the direction of George N. Thompson, Chief of Division of Codes and Specifications, National Bureau of Standards, the publication may be obtained from the Superintendent of Documents, Washington 25, D. C., at 30 cents per copy.

**Symposium On pH Measurement (Technical Publication No. 73)**—This 86-page publication, bound in paper cover, contains seven technical papers and discussions which together are intended to present the latest theory and practice on colorimetric and potentiometric methods for making pH and closely related measurements. Presented at the 49th annual meeting of the American Society for Testing Materials, these papers with respective authors are: Historical Review of the Hydrogen Electrode and the Calomel Cell in the Measurement of Hydrogen Ions, C. N. Myers; Definitions of pH and Extension of the Acidity Scale to Nonaqueous Systems, D. S. McKinney, Paul Fugassi, and J. C. Warner; Standard Buffer Solutions, George G. Manov; Recent Advances in the Theory and Use of Glass Electrodes for pH Determinations, Malcolm Dole; Precautions to be Observed in Making Colorimetric pH Determination, F. R. McCrumb; Acid-Base Equilibria in Aqueous and Nonaqueous Solutions, Martin Kilpatrick; and Potentiometric Estimation of Hydrogen Ion Concentration in Nonaqueous Media, L. Lykken. Priced at $1.50 a copy, the publication can be obtained from the American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa.

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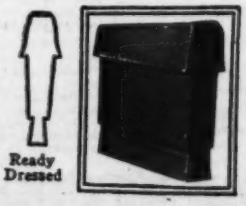

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# CURRENT MARKET QUOTATIONS

## RAGS (Domestic)

**NEW RAGS**

**Quotations to consuming mills, cents per pound or dollars per hundred pounds, f.o.b. New York, follow:**

**(All Prices Are Nominal)**

| | per cwt. |
|---|---|
| Blue Overalls | 8.75 to 9.25 |
| Corduroy, Men's | 6.50 to 7.00 |
| Corduroy, Ladies' | 6.50 to 7.00 |
| Washables, No. 1 | 5.50 to 5.75 |
| Percales | 7.50 to 8.00 |
| Light Prints, No. 1 | 7.50 to 8.00 |
| **Khaki Cuttings—** | |
| Bleachable | 7.25 to 7.75 |
| Unbleachable | 6.50 to 7.00 |
| New White Canvas | 12.00 to 13.00 |
| New Mixed Blacks | 5.50 to 6.00 |
| Canton Flannels, Bleached | 11.50 to 12.00 |
| **Shirt Cuttings—** | |
| New White No. 1 | 11.50 to 12.00 |
| White Shrunk | 10.50 to 11.00 |
| Silesias No. 1 | 8.75 to 9.25 |
| New Unbleached | 12.00 to 12.50 |
| Fancy | 6.75 to 7.25 |
| **Linen Cuttings—** | |
| American | 8.50 to 9.00 |
| White | 14.50 to 15.50 |
| Grey | 13.50 to 14.50 |

## RAGS (Domestic)

**OLD RAGS**

**Quotations to consuming mills, dollars per hundred pounds, f.o.b. New York, follow:**

**(All Prices Are Nominal)**

| | per cwt. |
|---|---|
| **Roofing—** | |
| No. 1 | 1.75 to 1.80 |
| No. 2 | 1.65 to 1.70 |
| No. 3 and No. 4 | 1.45 to 1.55 |
| **Twos and Blues—** | |
| Repacked | 3.25 to 3.50 |
| **Thirds and Blues—** | |
| Repacked | 3.00 to 3.25 |
| Miscellaneous | 2.50 to 2.75 |
| **Whites, No. 1—** | |
| Repacked | 4.50 to 4.75 |
| Miscellaneous | 3.75 to 4.00 |
| **White, No. 2—** | |
| Repacked | 3.50 to 3.75 |
| Miscellaneous | 3.00 to 3.25 |

## RAGS (Foreign)

ex dock New York City

**NEW RAGS**

| | per cwt. |
|---|---|
| New Dark Cuttings | Nominal |
| New Mixed Cuttings | |
| New Light Silesias | |
| Light Flannelettes | |
| Unbleached Cuttings | |
| New White Cuttings | |
| New Light Oxfords | |
| New Light Prints | |

## RAGS (Foreign)

ex dock New York City

**OLD RAGS**

| | per cwt. |
|---|---|
| No. 1 White Linens | Nominal |
| No. 2 White Linens | |
| No. 3 White Linens | |
| No. 4 White Linens | |
| No. 1 White Cottons | |
| No. 2 White Cottons | |
| No. 3 White Cottons | |
| No. 4 White Cottons | |
| Extra Light Prints | |
| Ord. Light Prints | |
| Med. Light Prints | |
| Dutch Blue Cottons | |
| French Blue Cottons | |
| French Blue Linens | |
| Checks and Blues | |
| Linsey Garments | |
| Dark Cottons | |
| Old Shopperies | |

## ROPE and BAGGING

**f.o.b. and ex dock New York City**

**(All Prices Are Nominal)**

| | per cwt. |
|---|---|
| **Gunny No. 1—** | |
| Foreign | Nominal |
| Domestic | 7.00 to 7.25 |
| **Wool Tares—** | |
| Light | 7.25 to 7.50 |
| Heavy | 7.75 to 8.00 |
| No. 1 Scrap Bagging | 6.25 to 6.50 |
| **Manila Rope—** | |
| No. 1 large | 6.50 to 6.75 |
| No. 1 small | 5.50 to 5.75 |
| **Sisal Rope—** | |
| No. 1 large | 6.00 to 6.50 |
| No. 1 small | 5.50 to 6.00 |
| New Burlap Cuttings | 7.25 to 7.50 |
| **Jute Threads—** | |
| Foreign (Nom.) | 6.50 to 7.00 |
| Domestic | 6.00 to 6.50 |
| **Strings—** | |
| No. 1 sisal | 5.50 to 5.75 |
| No. 2 sisal | 5.00 to 5.25 |
| Soft jute | 4.50 to 4.75 |
| Mixed | 2.50 to 2.75 |

## WASTE PAPER

**The following are quotations, dollars per ton, for No. 1 packing f.o.b. New York:**

**(All Prices Are Nominal)**

| | per ton |
|---|---|
| **Shavings—** | |
| Hard White Env. Cuts | 140.00— |
| Hard White, No. 1 | 120.00— |
| Soft White No. 1 | 100.00— |
| Soft White, One-cut | 120.00— |
| Soft White, Misc. | 90.00— |
| Fly Leaf, No. 1 | 55.00— |
| Fly Leaf, Woody, No. 1 | 45.00— |
| No. 2 Mixed Col. Woody | 30.00— |
| **Flat Stock—** | |
| No. 1 Heavy Books and Magazines | 25.00 to 27.00 |
| Mixed Books | 20.00 to 21.00 |
| **Ledger Stock—** | |
| No. 1 white | 80.00 to 85.00 |
| No. 1 Mixed (Colored) | 60.00 to 65.00 |
| **Manilas—** | |
| New Env. Cuttings | 95.00 to 100.00 |
| New Env. Cuts, One-Cut | — |
| Extra Manilas | — |
| Manila Tab Cards, Free of Ground Wood | 80.00 to 85.00 |
| Colored Manila Tab Cards | 65.00 to 70.00 |
| **Kraft—** | |
| New Envelope Cuttings | 100.00 to 110.00 |
| Tripled Sorted No. 1 100% | 70.00 to 75.00 |
| New 100% Cor. Cuts | 65.00 to 70.00 |
| No. 1 Old Assorted | 50.00 to 55.00 |
| **News—** | |
| White Blank | 85.00 to 90.00 |
| Overissue | 19.00 to 20.00 |
| No. 1 Baled | 15.00 to 16.00 |
| Old Corrugated Containers | 23.00 to 25.00 |
| New Corrugated Cuts | 37.00 to 39.00 |
| Mill Wrappers | 20.00 to 21.00 |
| Box Board Chips | 9.00 to 10.00 |
| No. 1 Mixed Paper | 11.00 to 12.00 |

## CHEMICALS

**f.o.b. shipping point**

**(All Prices Are Nominal)**

| | |
|---|---|
| **Alum (Papermakers)—** | |
| Lump, cwt. | 4.25— |
| Ground, cwt. | 4.60— |
| Powdered, cwt. | 4.45— |
| **Blanc Fixe—** | |
| Pulp, bulk, ton | 75.00— |
| Dry, barrels, pound | 82.50— |
| **Bleaching Powder—** | |
| Drums, cwt. | 3.00 to 3.50 |
| **Casein (Domestic Standard)** | |
| 20-30 mesh (bags), lb. | |
| 80-100 mesh (bags), lb. | 32.00 to 34.00 |
| Argentine, lb. | 29.00 to 30.00 |
| **China Clay—** | |
| Domestic Filler Bulk (mine) ton | 10.00 to 15.00 |
| Domestic Coating Bulk (mine) ton | 15.00 to 25.00 |
| Imported (ship side) Bulk (lump) ton | 22.00 to 30.00 |
| **Chlorine—** | |
| Tank cars (wks) cwt. | 2.25 to 2.50 |
| Gelatine (silicin), lb. | 1.60 to 1.65 |
| Glue, (C.P.) drums, lb. | .39½ to .40 |
| Litharge, powd., bbl., lb. | 19¼ to .20¼ |
| **Rosin (Gum)—** | |
| New York, per 100 lbs. | |
| E | 7.80— |
| F | 7.80— |
| G | 8.00— |
| WW | 8.25— |
| Rosin (Wood), carlots | 6.50— |
| **Salt Cake—** | |
| Dom. bulk (wks) ton | 20.00 to 25.00 |
| Imp. bulks on dock— (All. ports) ton (Nom.) | 25.00 to ——— |
| **Soda Ash—** | |
| Bulk (works), cwt. | 1.10 to 1.20 |
| Paper Bags, cwt. | 1.25 to 1.35 |
| Barrels, cwt. | 1.35 to 1.60 |
| **Soda (Caustic)—** | |
| Solid drums, cwt. | 2.65 to 2.85 |
| Ground and flake, drums, cwt. | 3.00 to 3.25 |
| **Sodium Silicate—** | |
| 60 deg., 55 gal. drums, (works) cwt. | 1.65 to 2.05 |
| 40 deg., 55 gal. drums, (works), cwt. | .80 to 1.45 |
| **Starch—** | |
| Pearl, 140 lb. bags, cwt. | 6.96— |
| Pearl, barrels, cwt. | 6.96— |
| Paper, (Sp.) bags, cw. | 6.96— |
| Powdered, barrels, cwt. | 7.07— |
| **Sulphur (Crude)** | |
| (Mine) bulk, long ton | 16.00 to 18.00 |
| **Talc—** | |
| Dom. 100 lb. bags (mine) ton | 20.00 to 28.00 |
| Canadian | 35.00 to 45.00 |
| **Titanium Dioxide—** | |
| Barium Pig, bbls., lb. | 18 to .18½ |
| Calcium Pig, bbls., lb. | 18 to .18½ |
| Zinc Sulphide, bbls., lb. | 11.50 to 11.75 |

## WOOD PULP

**Prices, dollars per short, air dry, tan, on dock American ports and f.o.b. shipping points with former OPA freight allowances, are:**

**(All Prices Are Nominal)**

| | |
|---|---|
| Bleached sulphite, Swedish | 185.00 to 195.00 |
| Bleached sulphite, Finnish | 187.50— |
| Bleached sulphite, dom. | 126.00 to 135.00 |
| Easy bleaching sulphite | — |
| Unbleached sulphite, Swed. | 155.00 to 157.00 |
| Unbleached sulphite, Fin. | 155.00— |
| Unbleached sulphite, dom. | 125.00 to 130.00 |
| Unbleached kraft, Swedish | 147.50— |
| Unbleached kraft, Finn. | 147.50— |
| Unbleached kraft, northern | 125.00 to 135.00 |
| Unbleached kraft, southern | 110.00 to 125.00 |
| Bleached sulphate, Swedish | 185.00 to 190.00 |
| Bleached soda, domestic | 130.00 to 135.00 |
| Sulphite screenings, dom. | 60.00 to 70.00 |
| Sulphate screenings, dom. | 60.00 to 70.00 |
| Groundwood, domestic and Canadian | 80.00 to 85.00 |

## PAPER

**f.o.b. New York City**

**(All Prices Are Nominal)**

| Boards— | per ton |
|---|---|
| Binders | 94.00— |
| Chip | 90.00— |
| Chip, tube and can | 95.00— |
| Chip, full blending | 97.50— |
| Chip, agl. mla. lined | 95.00— |
| Coated, white patent .010 | 120.00— |
| .020 and heavier | 110.00— |
| Kraft liner | 79.00— |
| Filled News | 90.00— |
| Container | 99.00— |

**Book Papers—f.o.b. mill with quantity, weight, manufacturing and other differentials allowed:**

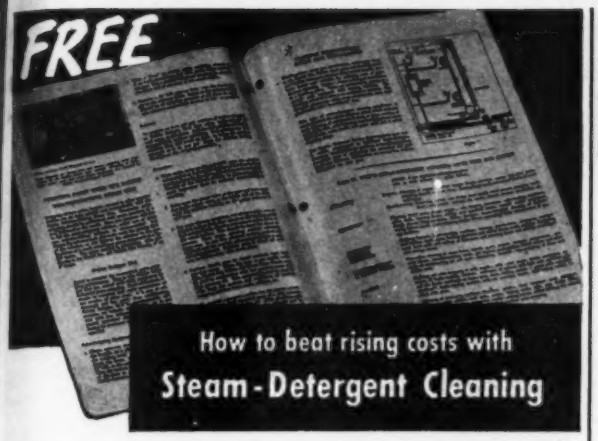
**(Per cwt. in ton lots)**

**Uncoated (Untrimmed)**

| | |
|---|---|
| Book, White (M. F.)— | |
| A Grade E. F. | 14.25— |
| B Grade E. F. | 13.30— |
| C Grade E. F. | — |
| D Grade E. F. | — |
| No. 2 Uncoated Offset 4 sides, White | — |
| Machine Coated White (Trimmed 4 sides) | |
| No. 1 Glossy | 19.55— |
| No. 2 Glossy | 18.30— |
| No. 3 Glossy | 17.60— |
| No. 4 Glossy | — |
| No. 2 Offset | 14.60— |
| C1S Litho (Varnish) | — |
| C1S Litho (Non-Varnish) | — |

**Writing Papers—f.o.b. mill with zone, quantity, packing and other differentials allowed:**

| Rag Content Bond— | per cwt. |
|---|---|
| (In Ton Lots) | |
| Extra 100% Rag | 48.70— |
| 100% Rag | 42.70— |
| 75% Rag | 33.10— |
| 50% Rag | 28.25— |
| 25% Rag | 25.10— |
| **Rag Content Ledger—** | per cwt. |
| (In Ton Lots) | |
| Extra 100% Rag | 43.70— |
| 100% Rag | 42.70— |
| 75% Rag | 33.10— |
| 50% Rag | 28.25— |
| 25% Rag | 25.10— |
| **Sulphite Bond—** | per cwt. |
| Air dry, watermarked | — |
| No. 1 watermarked | 18.50— |
| No. 2 watermarked | 17.55— |
| No. 4 watermarked | 16.85— |
| **Sulphite Ledger—** | per cwt. Zone 1 |
| No. 1 watermarked | 18.85— |
| No. 2 watermarked | 18.05— |
| No. 4 watermarked | 17.35— |
| **Glassine (f.o.b. mill)—** | per cwt. |
| Embossed (25 lbs. up) | — |
| Bleached (25 lb. up) | — |
| Unbleached (25 lb. up) | — |
| Greaseproof— Bleached (25 lb. up) | — |
| Unbleached (25 lb. up) | — |
| **News—** | per ton |
| Rolls, Standard (Contract) | 96.00— |
| Rolls (Spot) | (Nominal) |
| Sheets | 115.00— |
| **Tissues (Carlots)—** | per ream |
| White No. 1 | 1.85— |
| White No. 2 | 1.75— |
| Bleached Anti-Tarnish | — |
| Colored | — |
| Anti-Tarnish Kraft | 1.85— |
| Manila | 1.60— |
| Napkins, semi-crepe (12¼ lb. to M shts.) per cs. | .80— |
| Napkins, full crepe and smk'ssd (12½ lb. to M shts.) per cs. | .80— |
| Toilet, Bleached (M. shts.) per cs | 8.50 to 10.00 |
| Toilet, Unbleached (M. shts.) per cs | 8.50 to 10.00 |
| **Towels—** | per cwt. |
| Bleached | 4.75— |
| Unbleached | 4.00— |
| **Wrappings (Kraft)—** | per cwt. |
| Super-Standard | 9.00 to— |
| No. 1 Wrapping | 7.25 to 8.00 |
| Standard Wrapping | 6.50 to 7.00 |
| Standard Bag | 6.50 to 7.00 |
| Variety Bag | — |
| **Wrappings (Sulphite and Bleached Kraft)— (Rolls, f.o.b. mill)** | |
| **Bleached Papers—** | per cwt. |
| M.F. & M.G. Waxing, 20 lb. (Carloads only (10,000 lbs.) | — |
| Drug wrapp., 35 lb. | — |
| **Unbleached Papers—** | |
| Com. Gr. Butch. 40 lb. | — |
| No. 1 Butchers | — |
| No. 1 Imit. Parch & Dry Fin. Groc. Sulphite, 30 lb. | — |
| No. 1 Imit. Parch & Dry Fin. Groc. Sulphite, 30 lb. | — |
| Steam Finish, 50 lb. | — |
| Water Finish, 50 lb. | — |
| **Manilas—** | |
| Envp. M'ls., Sub. 16-40 (No. 1) | — |
| Envp. Mla., Sub. 16-28 (No. 2) | — |
| Envp. Mla. (Prices based on large sheets untrim'd ream-marked, in bdls.) | |
| Wrapp. Mla. 35 lb. up— | |
| No. 1 | — |
| No. 2 | — |
| **M.G. Sulphite and Kraft (other than Waxing)** | |
| Grade B30 lb. | — |
| Grade A-22 lb. | — |

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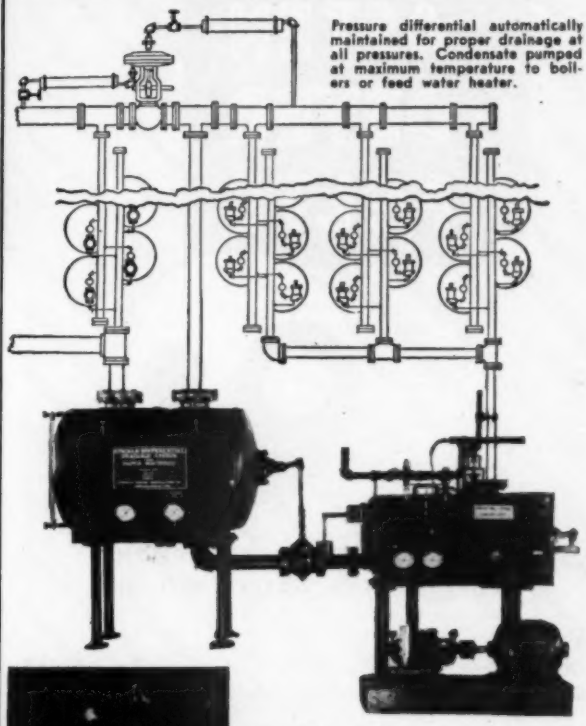

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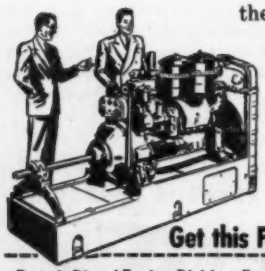

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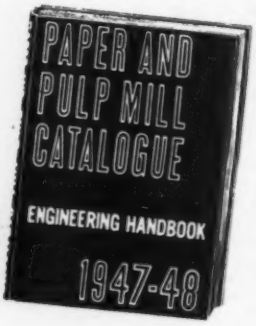


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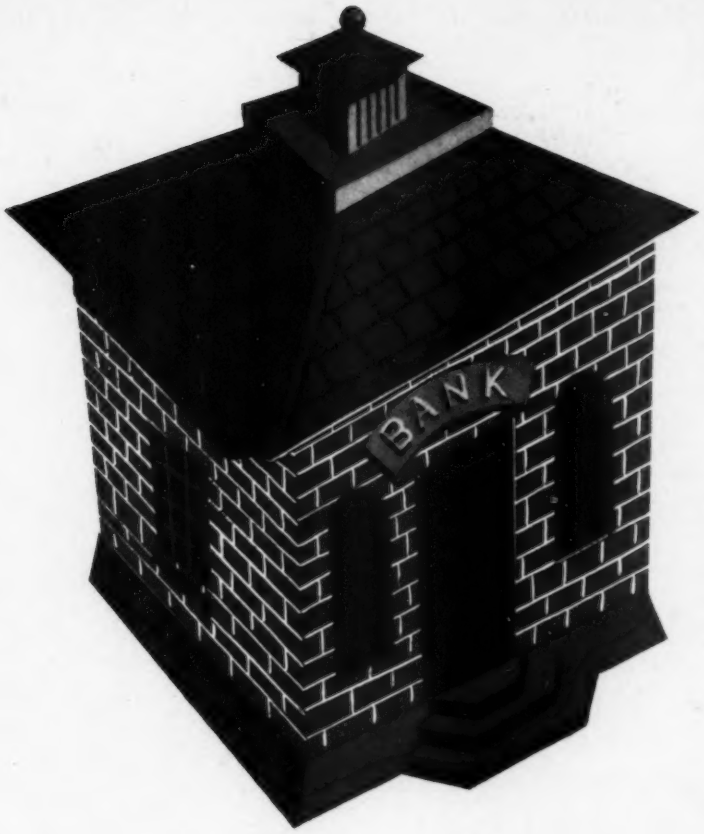


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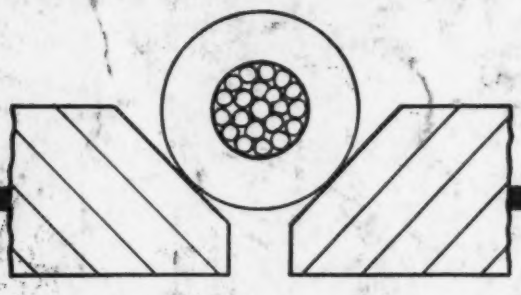
**SLITTERS AND ROLL WINDERS**

# LONGER FELT LIFE



## WITH THIS NEW TYPE CYLINDER SEAL

Reduced friction is one of the answers to longer felt life in a cylinder machine. This round rubber seal — self lubricated by water — eliminates the braking action of the usual felt seal, eases the pull on the felt, reduces the stretch, and helps keep the felt open.

But that's not all. With this new type seal you save washing-up time *(you just loosen and wash out)* and replacement time *(frequent replacements just aren't necessary)*. To use this seal you need specially designed chime rings on the cylinder and vat ends.

A small investment in equipping your cylinder machines with this new type seal will show you good returns . . . so why not investigate by writing for further information. We will be glad to work with you. Cheney Bigelow Wire Works, 417 Liberty St., Springfield, Mass.

**CHENEY BIGELOW**

**Pulp and Paper Mill Equipment**

**Fourdrinier Wires • Dandys • Cylinders • Wire Cloth**